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STATISTICAL AND DESCRIPTIVE REPORT

M2c

UPON THE



MINES, FARMS AND RANGES

OF

MADISON COUNTY, MONTANA.

GEORGE F. COPE, COMPILER.

VIRGINIA CITY, MADISON COUNTY, MONTANA.
SEPTEMBER, 1888.



Class F737

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MINES, FARMS AND RANGES

OF

MADISON COUNTY, MONTANA.

Messrs. Elling, Harrington, Hickman, Raymond and Farrell, constituting the Madison County Railroad Committee,

GENTLEMEN: As instructed by you in February last, I have by every means in my power endeavored to procure true and correct data from which to report to you the resources of Madison county, including the mines, farms and ranges, and the probable tonnage the county would afford a railroad. I derived my information on which to base my report, in the following manner, and I think that beyond peradventure it is reliable and correct, rather underestimating than overestimating in every particular. Feb. 10, 1888, I addressed a circular letter, embodying a list of printed questions, to every mining man, farmer, stockman and merchant in Madison county, which is as follows:

VIRGINIA CITY, Feb. 10, 1888.

DEAR SIR: The undersigned, having been selected at a meeting of the citizens of Madison county, as a committee of ways and means, to secure the building of railroads into and through the county of Madison; and we, the committee, deeming it advisable to furnish certain information in relation to the agricultural, mining, and stock resources of the county, and the probable tonnage that the mines, farms, and ranges of the county could furnish a railroad, take this method to obtain data from which they will be able to make a report.

By answering the following questions in relation to your farm, mine, and stock interest and giving the committee any other or further information at your command that would be of interest to railroad men you will much oblige,

Yours respectfully,

H. ELLING,
R. O. HICKMAN,
T. J. FARRELL,
F. HARRINGTON,
W. RAYMOND,
Committee.

Address all communications to Geo. F. Cope, Virginia City, Montana.

1-Rc-142

Name of Lode.
 Length of tunnels.
 Description of same.
 Depth and description of Shaft No. 1.
 Depth and description of Shaft No. 2.
 Depth and description of Shaft No. 3.
 Length of levels on Shaft No. 1.
 Length of levels on Shaft No. 2.
 Length of levels on Shaft No. 3.
 Width of vein at each opening.
 Width of pay ore at each opening.
 Character of ore; please be explicit and describe fully.
 Assay value of ore per ton.
 Gold.....dollars per ton.
 Silver.....ounces per ton.
 Lead.....per cent.
 Copper.....per cent.
 Iron.....per cent.
 How many tons have been shipped from the mine?
 How many tons have been worked in the county?
 How many tons have you on the dumps that would pay to ship with a railroad in the county?
 How many tons that will pay for working on the ground?
 How many tons do you estimate there is in sight that would pay for working?
 What did the ore shipped run per ton; give each shipment?
 What did the ore run per ton worked in the county (average)?
 About what has been the gross yield of the mine in dollars?
 Add anything you wish in this space in relation to the description of the mine and developments.
 How many tons of merchandise, machinery, etc., did you receive during 1887?
 How many tons of ore, etc., did you ship in 1887?
 If you own any coal mines give width of vein, character of coal, and amount of development.
 If you own any placer mines give general description and gross yield for the year 1887, number of men worked, locality, and extent of mine.

How many acres of land had you in cultivation, including all meadow and hay land, the year 1887?

How many bushels of wheat did you raise?
 How many bushels of oats did you raise?
 How many bushels of barley did you raise?
 How many bushels of peas did you raise?
 How many bushels of potatoes did you raise?
 How many pounds of cabbage did you raise?
 How many pounds of other vegetables did you raise?
 How many tons of hay did you raise, all kinds?
 How much hay could you raise if you had railroad facilities to ship the same to market?
 How many pounds of butter did you make?
 How many pounds of cheese did you make?
 How many tons of straw, all kinds, did you raise?
 How many beef steers have you ready for market or will you have ready by July next?
 How many mutton sheep have you ready for market?
 What was the amount, in pounds, of your wool clip?
 How many aged horses have you ready for market?
 How many hogs have you?
 How many cattle of all kinds have you?
 How many horses of all kinds have you?
 How many sheep of all kinds have you?
 How many tons of merchandise did you receive during the year 1887, including machinery of all kinds, fence wire, salt, etc.?
 How many tons of produce did you haul or ship from your place during the year 1887?
 Sign your name here.

At first I did not meet with much encouragement from those addressed, from the fact that the impression by some means obtained, that the real purpose of getting the information desired and set forth in the circulars was to increase the assessment of the county, get at the true amount of property of every one and turn the lists over to the assessor for his guidance. The very fact of its being well known that Madison county, at a low estimate, contained twice as much taxable property as the assessor's roll

disclosed, gave the report much credence, and the old adage, "The guilty flee when no man pursueth" was never more truthfully exemplified than in this scare given to our people by the circular letter referred to, for my returns show that the county is rich far beyond any estimate that has ever been placed upon it. I also obtained much valuable information traveling over the county visiting and examining mines, ranches and ranges and verifying reports which I had received, and I might mention the fact that while on these trips I conversed with a large number of the people of all sections of the county and found them thoroughly aroused on the subject of inducing railroads to be built into the county, and a free right of way could be obtained through any neighborhood in the county, the people are concerned to so great an extent in the enterprise.

On my several trips I was impressed very forcibly with the large area of unoccupied and vacant land in the county, and naturally inquired the cause. I was invariably informed that there was no means of transporting the product of the land now cultivated, therefore poor encouragement on that account to either cultivate more of the occupied land, or for persons to locate the vacant land; the universal cry is, "my granary is full and I can not sell at any price; true, I can haul to Butte or Boulder, but the price I would get for my load would not more than pay for the wagon transportation." On this account there is ten per cent less land being cultivated in 1888 than there was in 1887. It is true of some of the vacant land, that it will require a large outlay of capital to put water upon it, but take for instance the Jefferson valley in Madison county, from Silver Star to the mouth of South Boulder; it is estimated that there are several thousand acres of unoccupied land on the east south of the valley, which is known to be the very best wheat land in Montana; the few farmers scattered here and there along who have appropriated the waters of the small mountain streams coursing across this vast plateau, have demonstrated the fact that this particular section is peculiarly favored as to frosts, and frosted grain was never known in that locality.

To make this vast area of land available, large and long irrigating canals must be constructed conveying the waters of the Jefferson river upon the land. With the granaries full, of the farmers who are now cultivating but an iota of the land, it is poor encouragement for anyone either by his labor or capital to build canals to make this land productive; however, with a railroad through the

valley, judging from what has taken place after the advent of railroads into other valleys of far less promise, all the vast area referred to would be occupied in less than a year and within two be made to produce more than the entire county does at present. The same may also correctly be said of the Madison valley in Madison county; there are thousands of acres of unoccupied land and thousands of inches of water in the river, but the condition of things is such, that the water and the land will never be brought together until there is a railroad through the county to transport what the two can produce.

The existing condition of things as regards our agricultural interests will apply even more forcibly to our mining interests, and that which is true of the one is true of the other. While every range of mountains in the county is ribbed with gold, silver, lead, copper and iron mines, there is no great amount of work being done upon them on account of the great distance to rail transportation. It is patent to all and therefore not worth the saying, that a quartz mine out of reach of a railroad unless it be a high grade free gold mine, has nothing but a prospective value. It is rare in any country that a mine is found so rich that it will be remunerative without railroad advantages near by. Not having such advantages, while our neighboring counties have been fortunate enough to secure them, is the true secret of Madison county being behind her neighbors in prosperity to-day.

It is claimed by experts that there are more paying quartz propositions in the Tobacco Root range (which divides the county) than there are in any other county in Montana; though this very range, rich as it is, is so located, and the wealth it contains is so situated, that it is a barrier to successful quartz mining, without, and it seems that in its very creation, a railroad is demanded for the successful mining of the properties it contains. To illustrate: On the east and Madison slope, the mines are all gold bearing, refractory iron ores, while on the west and Ruby slope the mines are all silver-lead with the impassable summit of the range dividing the two. The character of the ores is such that they should be worked together, and were they together or could they be brought together at reasonable cost, they would make the most productive gold mining district in the world. From personal knowledge I know that there would have been two smelter plants erected on the east side of this range last season—one on Meadow creek and one at Pony—could the companies who had the matter in hand have been successful in finding lead ores with which to work the

gold-iron properties of those localities. On the west slope, though having an abundance of lead, there is no iron with which to work the same. Silver-lead ores must have iron, as gold-iron ores must have lead, and though the county has both, in larger quantities than has any other county in Montana, still, like Tantalus, with this vast wealth in the midst of us, indeed, within our grasp, we are practically starving for the want and necessity of a railroad to transport the wealth of the one section to the wealth of the other that both may be worked successfully and give us life. I feel confident, after making a thorough and crucial examination of the mines, that a railroad traversing the county within reach of these silver-lead and gold-iron districts would derive a larger tonnage in ores, concentrates, fuel, etc., from them than is now furnished by Wickes to the Wickes branch, or even by Butte to the Montana Union.

There are mountains of concentrating gold-iron ores on the east slope, notably the Pony properties, the Red Bluff and Potosi mines, and the Washington Bar and Richmond Flat ledges. These several districts could furnish, at a low estimate, from 2,000 to 3,000 tons of ore and concentrates a day. On the west slope, from a few miles below Virginia City to below Georgia Gulch, along Bivins, Ramshorn, Mill creek, Wisconsin and Indian creek, the country seems to be literally underlaid with silver-lead jigging ore, while at frequent intervals along the veins large bodies of galena are encountered, rich in silver. Within three months after a railroad taps that section, 3,000 tons of silver-lead ore and jig products each day could be ready for shipment. It seems to me that a county that can show any unprejudiced mining man its capacity to furnish 3,000 tons of gold-iron ore and 3,000 tons of silver-lead ore, daily, from mines within its borders deserves the attention of both the Great Falls and Helena smelters, and the managers of those plants should become as anxious to secure rail communication with a prospective output of such magnitude, as the people of this county are to get rail transportation to somebody's smelter for their ores.

At the head of Willow creek, located in the highest mountains in the county, are the Potosi belt of silver mines, the ore of which is of the chloride and black sulphurets character. Quite a large amount of ore has been packed out from these mines on horses and mules and shipped to Omaha, Wickes and other places, and no shipment has netted the owners less than one hundred dollars per ton. Of course the ore handled in this manner was necessarily

assorted ore, and while no inconsiderable portion of the ore contained in the veins is of this high grade, still the great merit of the Potosi belt lies in its vast quantities of low grade ore, of which there seems to be an exhaustless amount, the mines being very wide true fissure veins in granite, and the shoots of great length. I have taken great pains to examine the past history and present condition of what is known as the Summit mines, at the head of Alder Gulch, and have thought it proper to give you the facts as I have obtained them. In the first place I find it is a fact, that while Alder Gulch has the credit of having produced more placer gold than any other section of Montana, the quartz mines in the mountains along its course (partially from the fact of their being overshadowed by the great merit of the gulch as a placer gold producer, and further from the fact that they were the first quartz mines worked in Montana) have not received the credit they deserve and merit.

I find that in the early days of Alder Gulch it was as easy and attended with as little expense to obtain large amounts of gold from her quartz mines as it was from her gravel banks. At the head of the gulch there are a number of ledges that contained on the surface, and for from 100 to 200 feet in depth, large quantities of free milling gold ores that were very rich, producing from \$500 to \$1,000 per ton. While the placers were at their zenith these fine bodies of free milling ore were being worked, and, on account of the seemingly limitless quantities of gold then coming out of the gulch, attracted no great attention, and were exhausted, that is, worked down to the base ore, though in every instance the veins continued in width, but with the rude machinery at hand in those days, 1864 and 1866, it was found impossible to handle the base ores, and these veins that had produced millions of dollars in gold from free ores were abandoned at that early day and have never been worked since.

The history of the Oro Cache, a lode of the above class, will serve as an example. This mine was discovered in 1863 and was very rich in free gold, so rich that small fortunes were made pulverizing the ore in a hand mortar. There were several arastras run by horse power erected on the mine, and sometime after a rude quartz mill; and I can assure you, having seen the dates and figures, that the Oro Cache at that early day and by those rude methods produced \$1,250,000 in gold, from free gold quartz. The mine was "gutted" (the mode of mining in those days) down to the base ore and work was suspended, the owners being unable to

handle this class of ore, and this great mine lies to-day as it was abandoned then, with large bodies of iron sulphides of good grade, covered with the debris from the early workings of the mine. The history of the Oro Cache is also the history of the Kearsage, from which was taken in 1865 and 1866, from free quartz, a half million of dollars in gold; also the Keystone, Lucas, and many others.

There are 1,500 quartz lodes located in the county of Madison. This only covers valid locations, and does not include re-locations (the records of the county showing that there have been 6,000 records of quartz mines made in the county. The 1,500 mines referred to are mines that have been located and developed to a greater or less extent and many of which have been patented. The development work done upon these mines has demonstrated that they are valuable properties if they could be worked in proper manner. But it is utterly useless for miners to deceive themselves longer with hope of success without capital, machinery and rail communication, more especially the latter, as that will bring all the other necessities to put at least one hundred quartz mines in active operation in the county. These same quartz mines are at present in a "slough of despond," and in my opinion will remain so until they get a railroad on which to ship their ore and bring in capital and machinery. I have received reports from about all of the prominent mine owners in the county, and to embody in this report a reference to each particular mine in the county would make it far too voluminous. I have therefore thought best to take each district and report on the same as a whole, mentioning only a few of the most prominent mines in particular.

THE BEDFORD, MELROSE AND EXTENSIONS.

On the west slope of the Tobacco Root range, bordering the Ruby and Jefferson rivers, and including the Mill creek, Wisconsin and Georgia mining districts, there has been and is being done a large amount of development work; but the absence of proper machinery, and the distance to the railroad, prevents the owners of the mines from receiving benefit from any except the very high grade ore of their output. However, even with the long distance to transport, it has been found that these districts contain many mines that will produce ore in quantities sufficient to pay the great expense of shipping by team and leave a handsome margin. Several hundred tons of ore each season for the last ten years have been hauled to Dillon and shipped thence to different smelters. The ores of the districts named are unquestionably smelting ores,

and in most of the mines that have been developed the ore is what is termed wet, or fat ore, that is, containing lead or copper in some form in quantities sufficient to assist in smelting other ores of a dry or lean character, containing neither of the above properties; therefore the mines of these districts can correctly be termed wet ore mines, a character of ore that all smelters must have to assist the working of the high grade dry-lean ores.

That the section of country extending from a few miles northwest of Virginia City almost forty miles along the west slope of the Tobacco Root range, contains such ore in fabulous quantities is beyond question; true this character of ore is low grade (in silver and gold), as such ore is in most other localities, but it is fat in lead and in some of the mines also in copper. For example, from information received through reports from the owners and personal examination I find that the Bedford and Melrose mines, which are silver-lead properties and cover two full claims, have a width of vein of fifty feet, well defined, the entire vein containing first class jigging ore, the lead appearing as a sulphide, or galena, carrying silver with a silica gangue. The ore contains from 30 to 50 per cent lead, 25 ounces of silver and five dollars gold to the ton. One hundred and fifty tons of hand assorted ore has been shipped to the Omaha smelter from the mine, which netted the owner \$30 per ton over transportation and working; this of course, was hauled to Dillon by wagon, a distance of 50 miles. A tunnel has been run 100 feet into the mine, and a shaft sunk 50 feet. Some months since a Helena syndicate bonded the property, erected a complete steam hoist and pumping plant, and is developing the mine by sinking a two-compartment shaft, which is expected to cut the vein at a depth of 200 feet; a depth of 150 feet has already been attained. If the mine proves to be as good when cut by the straight shaft as it is in the other openings, large concentrating works will be erected this fall, a force of men will be put to work and the output will be concentrated for shipment. The development work that is being done upon this mine is being watched with a very keen interest, both by our mining men and citizens generally. There have been several extensions located upon the vein and experts claim that it can be traced on the surface for a distance of ten miles, showing large bodies of galena most of the distance. It is confidently asserted by men who claim to know, that this ledge alone will furnish tonnage sufficient to pay well for the operating of a railroad up the Ruby valley. I know from personal examination, having had experience in such matters,

that the Bedford, Melrose and their extensions, if worked to their full capacity, would produce more ore than is now being mined in Jefferson and Lewis and Clark counties combined. This ledge is 10 miles in length and from 30 to 50 feet in width, filled with ore that will pay to jig, with a railroad to transport the product. These are facts. Were there a railroad within easy reach, these mines would furnish from 500 to 1,000 tons of ore and concentrates a day for shipment. Near by are the

HIGHLAND MARY, AGITATOR, MATCHLESS AND GAEL.

These mines are quite promising properties and considerable development has been done upon them. The character of the ore is oxide and sulphuret of iron—dry ores, carrying gold—and assays from \$30 to \$100 per ton. The ore is base, however, and can not be worked with any machinery now in the county, but would work in nicely with the wet ores described above. Developments show about 10,000 tons of ore in sight that would pay to work.

BIG CHIEF MINE.

On Mill creek, a few miles further west in the same range (which creek, by the by, gives one of the finest water powers in Montana and on which can be found admirable points for the erection of smelters), is located the Big Chief mine, which is one of the strongest mines I have ever examined, as well as one of the most promising. The ore is a dry ore, but can not be treated successfully except by the smelter, as it is very refractory. The ore contains silver, gold, oxide and sulphide of iron, manganese, copper, also a small per cent of lead, and it is claimed a telluride of each of these metals, besides other metals of no value, but tending to make the ore refractory; however, there would be no difficulty in working by smelting process in conjunction with the wet ores of the vicinity. The mine carries some very rich ore; assays showing as high as \$1,700 have been made, supposed, though, to have been from samples containing unobserved telluride of gold. There have been several car loads of the ore shipped to Butte and Omaha. One shipment run \$225 per ton and another \$135. I take no one's word for this, as I have seen the returns as they came from the smelters.

THE BUCKEYE GROUP.

The Buckeye Group of mines, near by, consists of five locations upon the same vein, not only the whole length of which, but also the entire width of 600 feet, is a mass of ore and mineralized rock, and from the surface developments it would seem that to dig any place on the ground would show up ore. The mine, I think, will prove to be, when developed, a silver-lead property; now it shows gold, silver, galena, carbonates, sulphide of iron and copper.

The property has every indication of developing into a first class concentrating proposition. While some very fair grade assays have been reported to me, I think the great value in the mine lies in its promise of being a large producer of low grade jigging ores. For a fact, it is thought by myself as well as many others, that the entire surface of the mountain for several feet in depth would pay to work with plow and scraper and run through jigs, if there were facilities for shipping the concentrates. This group would furnish at least 100 tons of ore daily were there a railroad in the valley.

THE BULLION.

I have been thoroughly familiar with the Bullion mine, also near Mill creek, for 20 years, and I candidly think with the same surroundings and in the same hands, it would have equaled as an ore producer the famous Alta, or the Comet, of Jefferson county. Situated as it is, 40 miles from a railroad and much further from works that could handle the ore, it has been remunerative to the owner, having shipped more ore than perhaps any mine in the county to distant works. The vein is strong and wide, containing a wet ore that is high grade in galena with very little gangue. Most of the output could be most profitably worked as it comes from the mine, without concentrating, though the vein contains considerable jigging ore as well. The ore shipped was of course the best and cleanest galena that came out, and run, on an average, 144 ounces silver, \$8 gold, and 40 per cent lead to the ton. Now I do not wish to be understood as reporting the mine to promise to produce any great quantity of ore as high grade as that shipped, though there have been 160 tons of such ore shipped and there are many tons as good in the mine, but it is interspersed with ore of a lower grade, and, while the entire vein is not so rich, it all contains silver-lead sufficient to make it almost a high grade property of that character of ore. The mine is at present being worked by a Helena syndicate, and with the mines of the company adjoining could furnish a railroad from 50 to 100 tons of ore daily. There

has been a tunnel driven in on the vein 650 feet; this is at present being pushed further into the mountain and is developing the mine most thoroughly.

THE BROADGUAGE.

The Broadguage in the same vicinity is a low grade free gold mine from which 20,000 tons of ore have been worked in a stamp mill near by; the ore averaged about \$8 per ton, and the gross product of the mine has been \$160,000 in gold. All the free ore has been extracted and it is now in base.

THE TOLEDA.

There is a mine just north of the Bullion owned by Butte parties that is an immense vein deposit of low grade silver-lead ore and rivals the Bedford in extent. The vein has been developed with a tunnel running in on its course some 200 feet, at the end of which a shaft has been sunk 50 feet, throughout which workings the vein shows to be from 15 to 30 feet in width; there are 5 feet of galena that come from the mine ready for the smelter, containing about 40 per cent lead and 20 ounces of silver to the ton; there are also 10 feet of the vein that yields good jigging ore which will reduce to about 40 per cent; the gangue is silica, the concentrates being worth about 30 ounces silver and 60 per cent lead. The output of this mine if worked to its capacity would be governed solely by the facilities for handling the ore, and would be only a question of transportation. The ore from the mine could be delivered at a concentrator on Mill creek for \$1 per ton, including mining and carriage. The mine could be made to furnish from 100 to 200 tons per day. It is not worked at present, as the ore will not bear wagon transportation to the railroad. There have been a few car loads shipped from the mine to Butte and Omaha simply to test its value, and I understand nothing more will be done in the mine until railroads are nearer, as wagon hauling consumes too great a per cent of the margin left after paying for reducing, etc.

THE BELLE MINE, MILL CREEK.

The Belle lode at the head of Mill creek and near the dividing line between the silver-lead and gold-iron producing sections, strangely produces ore dissimilar to that of either locality, being a telluride, or tetradymite, and therefore very high grade, assaying as high as \$4,460 gold per ton. There have been 71½ tons of the ore worked on the ground by arasta process, which produced

\$5,000 gold. By that process it is not supposed that more than an infinitesimal portion of the gold contained in the ore was saved. The mine is well developed by tunnels and shafts to a depth of 180 feet, and 150 feet of levels have been run. The vein is 3 to 4 feet wide, containing from 4 to 18 inches of ore. The tellurium ore will of course require smelting, which will have to be packed on horses from the inaccessible locality at a cost of \$40 per ton.

THE PLYMOUTH ROCK.

The Plymouth Rock, a free milling vein in the same district, has a tunnel 200 feet in length, and a shaft 50 feet in depth, from which there have been mined and milled in the neighborhood of 160 tons of ore, yielding \$4,000.

THE M. G. & M. CO. GROUP.

The M. G. & M. Co., of Chicago, have a group of mines in the Wisconsin district, which are thought very highly of by mining men who have examined them and are known as the Cousin Sallie, Kenebec and Gen. Jackson. The Cousin Sallie has 300 feet of tunnels and two shafts, 90 and 190 feet deep. The surface ore is said to have been free gold and yielded \$52 in an arasta; the ore in sight now is base, being chloride and carbonate of lead, assaying 10 to 30 ounces in silver, \$9 gold, and 30 per cent lead to the ton; the vein is from 4 to 6 feet wide. The Kenebec has a 70 foot tunnel following the vein which is from 2 to 4 feet wide, filled with silicate and black manganese, reported to assay \$40 gold, 10 ounces silver and 30 per cent lead. The Gen. Jackson has had very little development work done upon it; the vein is 4 feet wide, of silicate and iron pyrites, also some little galena and a crystallization that indicates that the Jackson will be like other leads in the neighborhood, a lead producer when explored; reported assays show \$40 gold and 20 per cent lead. One thousand tons of ore ready for shipment now lie on the dumps of this group of mines.

THE COMPANY NO. 1.

The Company No. 1, in the same district, has a tunnel into the vein 222 feet long, one shaft 100 feet deep and another 75 feet; the vein is from 3 to 6 feet wide, with 2 feet of ore that assays \$75 gold and 20 ounces silver to the ton, contained in a character of ore that is termed free milling, though I think but a small portion of the assay value can be saved by such process. There have

been 600 tons of the ore milled in the county which gave a return of \$33 per ton. There are said to be several thousand tons of ore in sight in the mine.

THE NOBLE GROUP.

Several locations belonging to this group as I understand it, are extensions of the Company No. 1. The Noble property was sold some months since to a St. Louis company for \$95,000, and I understand is called a free gold proposition, at least it has been worked as such for the last 12 or 15 years and has been fairly remunerative. The ore is quartz with some white pyrites and oxide of iron intermingled therewith. I have been unable to get data on which to make a report as to yield or present condition of this property. All the ore heretofore mined has been worked in the company's mill on the ground. There are several thousand tons of vanner concentrates at the mill and a large amount of tailings, that I have been informed would make from \$75 to \$100 concentrates. The mine and mill are being worked at the present time.

THE DAMSAL GROUP.

What is known as the Damsal Group, in the same district, consisting of the Damsal, Champion, Sheridan and Gray Eagle mines, are all free milling. The Champion has been explored with a tunnel seven hundred and fifty feet on the course of the vein, at which point the Sheridan vein was cut running at right angles with the Champion vein. The Damsal and Gray Eagle have also been thoroughly developed and all shown to be fine properties. The ore discovered in all of them is of the same character—quartz with little or no base mineral—and if there is such a thing, these are free milling mines. The veins are large, well defined and regular, well filled with a good grade of ore. The openings are such that it is small cost to mine the ore, of which there are many thousand tons in sight. The company, composed of Chicago men of large means, is engaged in making further developments, uncovering more ore and working the output in so doing in a five-stamp free gold mill, saving only what gold adheres to the plates, of which I am told there is sufficient to pay all expense of the extensive explorations they are making besides leaving a nice margin.* The last run made by the mill of several hundred tons of ore, yielded thirty-two dollars a ton in gold; the expense of mining and milling was less than ten dollars a ton. These facts, taken in consideration with the great bodies of ore uncovered in the several mines,

place this property, when worked to their capacity, side by side in promise with the best dividend mines in the territory. The company, however, has shown no other desire, except to develop the properties and throw large bodies of ore in sight in several mines; if it were otherwise, a hundred stamps could be kept dropping on ore as readily as the five being run; they are evidently getting the property in shape for a boom, *a la* Crews-Drum Lummond, and my judgment is, that the Damsel Group will rival that great free gold mine when the time comes.

THE FAIRVIEW.

The Fairview, also in the Wisconsin district, is an immense lead of carbonate deposit, carrying 15 per cent lead and 20 ounces silver. The ore is 20 feet wide and the ledge can be traced on the surface for several thousand feet; the vein is in a contact of lime and granite and will be a large producer of low grade silver-lead ore as soon as there are shipping facilities at hand or demand for such ores in the vicinity. The ores from this mine will work excellently with the dry ores of the Damsel and Noble groups, which are near by. There is a large reef of silicious limestone very near the mine and fine water power can be obtained right at hand for smelting purposes.

HIGH RIDGE.

In the same range, and northwest a few miles, are the Tidal Wave, Georgia and Bear Gulch districts, across which a grand ledge courses from east to west, and on which there have been seven locations made of 1,500 feet each in length. The vein has been uncovered here and there for a distance of two miles and about the same character of ore is found the entire distance, being, galena and carbonate. The country rock is lime. The most western mine on this great ledge is the High Ridge, which has been fairly developed and several car loads of ore have been shipped therefrom, I understand with fair results, but the wagon transportation of forty miles, added to that of rail and reducing the ore, was a little more than it would stand and leave a margin, but it is claimed that with railroad facilities the vein could be worked with a good profit.

THE SATURDAY NIGHT.

Next on the ledge is the Saturday Night, that produces the same grade of galena and carbonate ore that is found in the High Ridge. This mine also has been pretty well developed by tunnels and

shafts, and has shipped twenty-five tons to Omaha that proved that it would be first-class ore, if worked near by or were it within reach of a railroad.

THE VAN METER.

The next mine on the vein is the Van Meter, which, like the others, has been developed sufficiently to show it to contain the same character of ore, with a good promise generally.

THE KEYNOTE.

Then comes the Keynote, on the same vein, reported as follows: One shaft sunk with the dip of the vein, which is 15 degrees north, to the depth of 100 feet, and levels driven 150 feet each way on the vein from the bottom of the shaft. Throughout the entire openings, the vein is of galena and carbonate ore, from 2 to 3 feet wide, which produces by actual reduction (the ore being shipped as soon as it is mined to Omaha and other smelters) \$20 gold, 38 ounces silver and 60 per cent lead to the ton. The owner is taking the world easy, has enough ore in sight to last him his lifetime, and says he don't care a damn whether a railroad is built to his camp or not, as his ore will pay to haul with bulls, clear to Omaha, with a little "closer sortin'," and as for taking out more of it he would rather have the money in the mine than in the bank. He is taking out from five to twenty tons a week, just as the notion suits him, though he could as easily knock down that much a day.

THE FLORA.

The next mine on the ledge is the Flora. This mine has been developed sufficiently to show it to be about the same character and grade as other portions of the ledge, with a good showing of galena and carbonates.

THE FUSILADE.

The Fusilade adjoining on the same ledge has about the same general appearance and outlook.

THE DILLIBAUGH.

The Dillibaugh adjoining on the same vein has been explored to a somewhat greater extent, showing, though, the same galena and carbonate ore, of which one shipment has been made to Omaha.

THE EMPIRE.

In the same locality is the Empire State mine, with a first rate showing for an extraordinarily fine mine, on which there has been run a tunnel 255 feet long, uncovering one of the strongest, best defined and most regular veins in the district, containing as it does from 6 to 8 feet of galena and carbonate ore that has been returning the owners \$90 per ton. Thus far the output of choice ore has gone to the Omaha smelter, but it is the purpose of the company to erect concentrating works and hereafter reduce the shipping ore as well as the low grade galena, to a high grade of lead concentrates and ship the product. Heretofore they have been obliged to pay nine dollars per ton wagon freight which has necessitated the shipping of only selected ore.

THE GRAY CLOUD.

Strange as it may seem in the midst of this carbonate country there is a free gold vein, Gray Cloud by name, that has produced 350 tons of ore that milled from \$60 to \$90 per ton. The ore is iron pyrites. The owners claim to have 40 tons of such ore on the dump and 300 tons in sight.

THE DORA.

High up on the mountain is the Dora, a silver-lead vein which has been explored to some extent and from which a few shipments have been made to Omaha. I understand they were satisfactory and the mine will resume work in a few weeks.

SILVER PLUME, HEAD LIGHT AND CHIDA DEA.

In Bear Gulch there are quite a number of promising properties. Among others are the North Star, silver-lead, which assays 80 ounces silver to the ton; the Chida Dea, also silver-lead, assaying 72 ounces silver; the Silver Plume, silver-lead, assaying 60 ounces silver per ton; and the Head Light, also silver-lead, which assays 55 ounces silver and 45 per cent lead to the ton, all of which have had more or less work done upon them.

On the Edwin Forrest a shaft has been sunk 100 feet, at which depth a fine body of pay ore was encountered 4½ feet wide containing \$21 gold and \$2 silver to the ton.

PONY DISTRICT.

We will now cross this Tobacco Root range and *presto, change*; from being in a silver-lead country we are now in the most extensive iron-gold section on the continent. While it was lead, lead, lead, over there, it is iron, iron, iron, over here; there we had hills of lead, while here we have mountains of auriferous iron. There is very little silver or lead on this side; ten and twelve years back there was some very rich free gold ore found on the surface of the mines and several fortunes were made working the same, but the veins are now all down to base ore. The district is a dry ore camp, though its ores, which are iron pyrites with oxides of iron mixed through, would be very advantagous to combine with the wet ores of the other side. Strawberry mountain, for a distance of a mile in length and 600 to 1,000 feet in width, is one mass of iron pyrites, quartz, porphyry and mineralized rock, containing gold in greater or less quantities. There have been several locations made as separate veins, parallel to each other on this mountain, but I am inclined to believe that they are but one monster ledge coursing up and down the mountain. There has been a tunnel run cutting the formation and mountain at right-angles with the ledges on the same. From the mouth of the tunnel the rock is impregnated more or less with iron and continues so a distance of seventy-five feet, at which point the Keystone vein is cut by the tunnel, disclosing a large body of sulphide ore. There have been several thousand tons of ore milled from this point and other openings on the Keystone vein which yielded \$15 in free gold per ton. While this ore was called free and was milled as such, it was really semi-base, and not more than 60 per cent of the value was obtained. The vein is very strong and pronounced fissure, from 12 to 20 feet in width, filled with first class concentrating ore, with here and there stratas of very high grade gold rock showing on the face, from which samples could be obtained that would go up into the hundreds. A sample, taken without regard to choice from across the face of the several openings, gives an average assay of \$25 per ton; about five tons of the ore can be run into one, making concentrates of a very good grade, and being as they would be, iron sulphides, a very desirable product for smelters working wet or silver-lead ores.

In the tunnel referred to above, 96 feet from the Keystone, the vein known as the Crevice No. 1 was cut. In running this 96 feet numerous small stratas of iron pyrites were crossed and the rock,

the entire distance; is strongly mineralized and considerably impregnated with iron; a chip taken miscellaneously along the 96 feet will assay from \$5 to \$8 in gold to the ton. Levels have been extended, east and west along the Crevice No. 1, and from the point where the tunnel cuts the vein, for a distance of 200 feet, several upraises have been made, all of which have disclosed fine bodies of ore on every side, averaging five to six feet in width. The Crevice differs little from the Keystone, except that it contains more pyrites and less gangue, and while it can not be reduced to as great an extent as the former, it will probably yield cleaner concentrates, as the iron is more confined in the rock and not so disseminated, while at the same time containing more gold.

The vein samples, taking the entire width of the face, in all the openings, from \$35 to \$45 per ton in gold and 5 to 6 ounces in silver. Seventy-six feet from the Crevice No. 1 the tunnel cuts the Crevice vein. This mine has been a great producer of so-called free milling ore, though had the ore been worked as base, the owners would have received double the returns they did from the mine. One run of 400 tons yielded \$70 per ton, while another run of 400 tons gave a return of \$90 per ton. About all of this class of ore has been stoped out and the Crevice is now called (as it should have been when discovered) a base ore gold mine. The explorations have disclosed immense bodies of fine iron pyrites, with just enough peacock copper and copper pyrites to make the ore attractive in appearance and convince the most skeptical that it is a great property. The Crevice, like the Crevice No. 1, produces as good concentrating ore as could be desired; however, quite a proportion of the output, judging from several hundred tons now lying on the dump, and the showing in the openings, will be ready for the smelter as it is knocked down from the vein, containing as it does very little gangue. Samples taken from all the openings, and across the face in every instance, averaged by assay from \$30 to \$50 per ton, the ore body measuring about five feet.

The Strawberry mine proper lies some 200 feet further into the hill and the tunnel has not been extended far enough to cut it as yet. Two tunnels cutting the vein at a less depth, however, have been run and a shaft sunk 115 feet with levels run each way, all of which have developed the Strawberry very thoroughly. If there is such a thing as distinguishing the one from the other, the Strawberry shows to be the big mine of the hill, as the ore bodies are much larger and the developments indicate that it would be the greatest producer if put to its mettle. The vein is large and well

filled with an excellent class of concentrating ore. The concentrates are sulphide and mono-oxide of iron, a product that would be greatly sought after by smelters were the mine within reach of a railroad. In early days this mine produced several thousand tons of high grade free gold rock from upper workings. The output of the mine at present (it is being worked) is from 25 to 30 tons per day, of free milling ore from surface openings made this spring. The ore is being milled in a free gold mill near at hand. Samples from all the levels in base ore, taken across the face, give an average assay of \$30 a ton.

The Willow Creek mine is an extension and on the Strawberry vein. This mine is one of the most perfect fissures I have ever examined, the walls are as regular and smooth as a marble slab, with a gangue of 8 to 10 inches of talc on the hanging. The vein is from 6 to 10 feet in width, filled with ore that will concentrate readily 4 tons into one, making a very desirable product, consisting of sulphide of iron, containing five ounces of gold to the ton. The ore contains no silver excepting that in combination with the gold. The Willow Creek has been one of the largest producers of free milling ore ever worked in the county. There has been a tunnel driven into the mountain, which is very abrupt, six hundred feet, about on the line of demarcation or change in the ore body from free milling to base, through which tunnel the free milling ore has all been extracted and conveyed from the vein overhead. How many tons have been thus worked I am unable to report, though I am assured that it has been several thousand, all of which was rich, many runs going as high as \$100 a ton; the mine has produced not less than a quarter of a million of dollars in gold, but this is considered by experts to be a mere bagatelle in comparison to what lies in the immense deposits of base ore which have been uncovered in the mine, but which can not be made available until railroads are constructed to the vicinity. The Ned mine, running nearly parallel with the Willow Creek and supposed to be an extension of one of the veins on Strawberry Hill, has been worked for a number of years and has produced a great many tons of high grade free milling ore, all of which has been stoped out above water level. There is a tunnel being driven at present to tap the vein at a much lower level, which will drain the mine. The above described mines are all patented and well developed and the only reason they have not taken their merited places along side of the great producers and dividend paying mines of the territory is their isolation from rail transportation, being just such a class of mines

as can not be operated profitably without a railroad convenient; containing ore, desirable ore, in unlimited quantities but not carrying gold sufficient to bear wagon transportation to distant works, neither is it rich enough to bear the wagoning of wet ores and fuel into the locality to enable the working of the product of the mines on the ground. Therefore the situation has resolved itself into this; a railroad must be had for the successful working of the mines or they must remain comparatively idle. Strawberry Hill and the Willow Creek mine, I am confident, after a thorough inspection of the mines and openings, could be made to furnish 1,000 tons of ore and concentrates a day, of fair grade in gold, the ore about 30 per cent sulphide of iron and the concentrates 85 per cent to 95 per cent sulphide of iron. These mines are at the head of one of the most productive valleys in Montana, the product of which is now being hauled by wagon to Butte, Boulder and other points, and I am informed at least 200 horses are continually so employed.

There are eight or ten other very promising mines in the district, of about the same grade and character as those reported upon. To particularize as to each, would necessitate the repetition of about the same words as have been used in reporting the Keystone, Ned and others. There are upon the dumps and in the mills of the several mines of the district, over 2,000 tons of base ore and concentrates awaiting a railroad for shipment.

THE EMMETT MINE.

The Emmett ledge in the same locality has a tunnel 25 feet in length, two shafts 100 and 140 feet in depth, from which have been run levels 210 and 160 feet in length. The vein is from 3 to 6 feet wide, containing from 6 to 30 inches of free milling pay ore. There have been 700 tons of ore from the mine milled in the county, averaging \$30 a ton, though some of the runs went very high, sampling frequently as high as \$250 a ton. The ore contains but little base metal, most of the output having been honey-comb quartz, easily mined and worked. It is now stoped out down to water level; what is under the water has not been ascertained.

RED BLUFF DISTRICT.

Twelve miles from Pony and on the same east slope of the Tobacco Root range, is Red Bluff district, another gold-iron camp equal in extent, development and richness to Pony. There are several veins in that district which were they in Lewis and Clark

or Silver Bow counties, within the reach of a railroad, would be second to none in Montana as producers and dividend paying mines. Chief among these is

THE GOLCONDA LEDGE,

a mine showing to be wonderfully strong, well defined, remarkably regular and a true fissure vein beyond question. The Golconda has been developed and explored more thoroughly than any other mine in the county. Tunnel No. 1 on the mine has been extended 845 feet, following the vein. Tunnel No. 2, 190 feet, and tunnel No. 3, 75 feet. Shaft No. 1, 25 feet in depth; shaft No. 2, 107 feet; shaft No. 3, 55 feet, and shaft No. 4, 60 feet. Three levels have also been run; No. 1, 100 feet in length, No. 2, 100 feet in length and No. 3, 100 feet in length, being an aggregate length of openings on the mine of 1,597 feet, disclosing fine bodies of ore throughout and showing up by actual measurement 30,000 tons of ore that can be mined at a cost not exceeding \$2 per ton. The ore bodies are from 8 to 15 feet in width, as demonstrated by numerous cross-cuts made in the several openings, all workable ore. The ore is a decomposed quartz, carrying iron sulphide, with tellurium in conjunction with gold and the baser metals, rendering the ore very refractory to work in any manner except with the smelter. It is a dry smelting ore and can not be worked successfully otherwise. There have been hundreds of samples taken from every portion of the mine for analysis, which gave a return of from \$38 to \$150 per ton, gold; a general average of all assays gave \$40 gold and two and one-half ounces silver. Fifty tons of the ore have been shipped to smelting works, in three lots. Lot No. 1 gave a return of \$36 gold per ton, No. 2 gave \$92 per ton and lot No. 3, of 20 tons, gave \$65 per ton. Lots No. 2 and 3 were assorted to some extent; lot No. 1 was shipped just as it came out of the mine, and was if anything below the average value of the ore body. These shipments were made as a test and not, of course, for profit therein contained. There have been 700 tons of the ore worked by free mill on the ground, which gave an average return of \$13 per ton. There are about 500 tons of ore on the dump, there has been no stoping done in the mine and the ore bodies are intact, the owners having been desirous only to completely develop the property. After trying every means to work the ore with machinery at hand, which is a free gold mill, and not succeeding in saving more than 30 per cent of the gold, they tried hauling by wagon to the railroad and shipping to a smelter, but the cost was so great that they abandoned

it, as they could plainly see almost the entire product of the mine with such a course would be consumed by the teamster, the railroad and the smelter. They are therefore placidly and prayerfully awaiting the advent of a railroad to the district, which they feel confident will come. But there is the rub; they are getting old; one of them has no heirs to leave the mine to, who could wait another decade or two for a railroad to be built to the county. The mine will produce, if worked commensurate with openings and capacity, 200 tons of ore a day. In going through the several tunnels and shafts, one travels nearly a third of a mile, and I have never seen a mine that showed ore so universally on every side.

THE WATER LODGE.

The Water Lode, near by, has a tunnel 60 feet, and another 85 feet in length, both on the ledge. The vein is 5 feet in width with a 4 foot width of pay ore. The ore is sulphide intermingled with mono-oxide of iron and some little galena.

The ore is high grade, but one of the most unsatisfactory veins to sample that I know of; it is not uncommon to get a sample from across the face assaying as high as \$400 a ton, while a second sample taken from near the same place would not go more than \$40 per ton. Gold predominates in this mine, as in most others on this side of the mountain. There have been 200 tons of the ore worked by free mill process, which gave an average return of \$30 per ton. To secure this 200 tons the free ore was selected from the dumps, and there are now 1,500 tons of base ore on the same which will have to be shipped for reduction.

THE RED BLUFF LODGE.

Dividing the honors with the Golconda as a noted ledge of this camp is the Red Bluff, from which the district takes its name. This mine was discovered in 1866 and was worked successfully for many years as a free milling property. Twenty and twenty-two years ago it was one of the most noted mines in the territory, but after the extraction of the surface free ore it lost its prestige until, in later years, the large bodies of base ore were uncovered in seeking free ore on the lower levels. The ledge is a very strong one and one of the best defined in the county. The surface ore was quartz, jasper and peroxide of iron which, near water level, changed to sulphide of iron with silicious gangue matter. The deepest exploration is a shaft 170 feet in depth which was sunk some 20 years ago. Considering the mode used for freeing mines

of water at that date, it was very wet. A very fine body of sulphide of iron, mingled with which is antimony, arsenic, copper and galena, was encountered at the bottom of this shaft. There is only a small portion of the ore that is gangue, and therefore it can be hand assorted sufficiently to make a good grade of smelting ore, were there a smelter at hand or rail facilities for transporting the ore. There has been a tunnel run, commencing at the base of the hill and driven at almost right angles with the course of the vein, cutting the same a distance of 400 feet from the mouth of the tunnel and some distance below water level, but on tapping the vein it was discovered that most of the ore above that level had been mined out, and the flow of water was so great coming from the shaft, which is 30 feet lower than the level of the tunnel, that heavy pumping machinery was found to be necessary before the mine could be worked to a deeper level. The owners not having the capital required and in view of the fact of there being no works near in which the ore could be reduced, and no mode of transporting the same to such works, further developments were deferred until the present or future generations shall construct works in or a railroad to the district. There have been over \$100,000 obtained from the free ore raised from the mine which averaged \$50 per ton by free milling, that is, saved on copper plates alone. The base ore at the lowest level is 5 to 6 feet in width and samples \$50 gold and \$5 silver per ton.

THE MOHEGAN.

The Mohegan, two miles from Red Bluff village, is a fine claim and has been mined successfully for several years. Explorations have reached the depth of 110 feet and levels have been run each way on the vein at that depth, 300 feet, which have developed a large body of very rich ore. The Mohegan is a very peculiar ore, having but very little iron and no other base metal in sight, while at the same time very refractory. It is called by some mineralogists quartz cement, though let it be what it may, it has yielded some of the highest grade gold ore ever found in the county, while considerable of the ore shipped to Eastern works gave a yield of \$600 and \$1,000 to the ton. The entire vein samples \$75 per ton. It is strictly a gold ledge, the bullion being very fine and having but a small per cent of silver. All the ore above water level has been mined out, the high grade shipped and the poorer grade, of which there are several hundred tons, now lies on the dumps waiting cheap transportation. It is a dry ore and

THE PARNELL.

The Parnell, or better known as the Old Bradley, mine is on the opposite slope from the Boaz. This is another of the early discoveries of the camp. It has been developed by a tunnel 430 feet in length, three shafts 60, 58, and 30 feet in depth, and a level from the lowest opening 60 feet long. In these several openings the vein shows to be 7, $6\frac{1}{2}$ and 8 feet in width; the width of vein in the face of the tunnel is full 20 feet, of which full seven-eighths is pay ore. The ore is magnetic oxide of iron, manganese and sulphide of copper. There is a wide range in the result of assays had from the ore, from \$5 to \$135 per ton having been obtained, mostly gold. There have been 500 tons of the ore worked by stamp mill with a result of \$10 per ton, and 50,000 tons in sight in the mine is reported.

THE BOSTON.

The Boston, near by, has a tunnel 340 feet and a level 175 feet in length. This ground contains 3 veins of 2, 4, and 2 feet in width, with porphyry lead matter between. The ore is oxide and sulphide of iron and copper pyrites, assaying 12 per cent copper, \$47 gold and 8 ounces silver to the ton. One hundred and fifty tons have been worked in the county which run \$25 in a free mill.

THE OSBORN.

The Osborn is another gold ledge of the district. Though but little developed, it has a good showing. A 50-foot shaft has been sunk on the vein. The ore is porous, light quartz, assaying as high as \$83 to the ton. There has been no ore shipped from the mine, the owners singing the same song heard from all the miners of the county, "expense of hauling is too great to leave a margin sufficient to warrant a man in digging out ore bodies he has been years in uncovering."

RICHMOND FLAT, STERLING, HOT SPRINGS AND NORWEGIAN
DISTRICTS.

Quartz mining was inaugurated in these districts as early as in any other portion of Montana. The ore on the surface was free and in many of the ledges rich in gold.

THE PONY MINE.

The Pony ledge near the village of Sterling, if intact to-day as it was in 1865, would create a furor in mining circles. There has never been but one ore body found on the vein, and this was in 1865. This shoot was 5 feet wide and about 100 feet in length and was at that early day worked down to a depth where water prevented further explorations. There is no ore in sight in the mine at present and very little work has been done to discover other ore bodies since the rich shoot was exhausted. The ore was sulphide and oxide of iron, copper pyrites, antimony and arsenic, though base in every sense of the word, and contained \$85 a ton in free gold, that was saved on copper plates by the old fashioned mill process. The shoot of ore mentioned produced \$100,000 by such means. What is under water in the Pony remains for some fellow to find out.

THE GALENA.

The Galena ledge, galena though only in name, another of the early day gold mines of the county, has produced many ounces of gold, just how much no one can tell, as it has been worked by Tom, Dick and Harry, for the last quarter of a century. I have reliable information, however, of 800 tons having been milled, from which was obtained on copper plates \$25,000. When worked the vein was 6 feet wide, well filled with sulphide of iron and copper pyrites, with a white quartz gangue. On the surface the ore was somewhat honey-combed by the decomposition of the iron. The ore assayed on an average \$57 a ton gold and 3 ounces silver and milled \$30. Two tons have been shipped as a test to a smelter which gave a return of \$90 per ton. The ore that could be worked by free mill has been exhausted, but there are about 500 tons of base ore on the dumps that would leave a margin over transportation and working.

THE GROWLER

is located on Norwegian Gulch, on which a tunnel has been run 48 feet showing a vein 12 feet wide of very base ore, about half the weight of which is iron. The ore assays from \$9 to \$57 per ton in gold. About 40 tons of the ore have been worked in an arastra yielding \$300.

THE TRADE DOLLAR

near by, looks well, but sufficient work has not been done to make a reliable report. The owner says the vein is from 6 to 15 feet wide, filled with base refractory ore containing gold, silver, lead, iron, and copper, all chemically combined, and assaying from \$13 to \$45 gold and 6 to 63 ounces silver.

THE ARCTIC,

in Upper Hot Spring district, has a tunnel driven on the vein 50 feet, and three shafts, 40, 25, and 50 feet in depth, showing a vein 2 feet wide of ore containing gold, silver, copper, lead and iron. First class ore assays \$200, second class \$40. Seventy-five tons have been worked by arasta, yielding \$3,000. This is a very promising property, developments considered.

THE BLACK HAWK.

The Black Hawk, near by, has been developed by a tunnel 100 feet in length, disclosing a vein 3 feet wide of very base ore, containing 20 per cent copper and 25 ounces of silver. No facilities for working the ore and too low grade to ship.

THE CENTENNIAL.

The Centennial has a tunnel 100 feet long and a shaft sunk 20 feet at the end of the same. Width of vein 3 feet, of iron and copper pyrites, carrying from \$20 to \$60 in gold; there have been 50 tons of the ore worked by free mill, yielding \$1,200.

THE FLAT.

The Flat ledge in the same district has a tunnel 100 feet long, which has developed a good looking vein 2 feet wide, of iron and lead ore which assays from \$100 to \$125 per ton.

THE ARKANSAS.

On Richmond Flat the Arkansas, one of the most promising mines in the section, is a late discovery. The pay ore in the vein is quite high grade. A test shipment of 6 tons was made some time since and gave a yield of \$237 per ton, mostly gold. The ore is base and must be shipped to a smelter for reduction, but this expense of course the ore will bear, and the mine is being worked and the ore sacked for shipment. An experiment was made with 16 tons of the same kind of ore as that shipped by working in a

free gold mill which resulted in a yield of only \$16 per ton, which has convinced the owners that the output of the mine must be shipped.

THE BELLE OF DETROIT.

The Belle of Detroit on the same flat, is one of the old timers, having been found in 1865, since which time it has been worked off and on in a desultory manner, and has yielded as a result of such work \$20,000. The ore worked has averaged \$20 per ton, though some runs have gone much higher. The assay value of the ore is from \$40 to \$100 per ton, almost equally divided between gold and silver. There is a tunnel 150 feet and two shafts, one 170 feet, the other 80 feet in depth, on the vein.

THE AMERICAN GIRL.

The American Girl, another gold ledge on the hill, has quite a promising show of base ore. Fifty tons of the ore have been worked in the county by free mill from which a yield was had of \$1,000. The ore assaying as it does \$85 per ton, gold, this run satisfied the owners that free mill was not the correct way of working, and they are preparing to ship the output of the mine.

THE IDAHO.

The Idaho, near by, is another old timer, a shaft having been sunk on it to a depth of 190 feet in 1863. They were hunting for free ore in those days and failed to find it in the Idaho. There have been 75 tons of the ore worked which returned \$3,000, mostly gold. The ore assays \$68 per ton and the vein is 15 inches wide.

THE PEERLESS.

The Peerless, in the same district, is a promising prospect, but slightly developed. The vein is 3 feet wide containing 12 inches of base ore, assaying \$45 per ton, mostly gold; 75 tons have been worked in the county yielding \$16 per ton.

THE REVENUE MINE.

The Revenue mine, owned and operated by a Boston company, is perhaps the best developed on the flat and is now being worked vigorously by the company. The output of the mine, which is quite large, though containing considerable base, is being worked through the company's mill, which is a stamp copperplate wet crusher, depending on a series of concentrators through which the pulp is run, after leaving the plates, to recover the base in the ore,

which I suppose will be shipped to a smelter for reduction. There has been quite a large amount of development work done on the mine. Shaft No. 1, which is a double compartment, has been sunk 250 feet, shaft No. 2, 80 feet, shaft No. 3, double compartment, 140 feet, from which levels have been run as follows: No. 1, 480 feet; No. 2, 200 feet; No. 3, 100 feet. The vein in shaft No. 1 is 14 feet wide; in shaft No. 2, 12 feet wide, and in shaft No. 3, 7 feet wide, three-fourths of which in each case is pay ore. Considering the width of the vein the waste is slight. The ore is honey-comb quartz with spots of peroxide of iron. In much of the ore the iron has disappeared, only leaving the stain. There is so great a range in the grade of the ore coming from different portions of the vein that it is impossible to give an average value without a pulp sample, which I have been unable to obtain. Ore from the several faces in the openings assayed from \$25 to \$1,200 per ton. There have been 2,000 tons of the ore shipped to Eastern works, 1,000 tons worked by the company's mill on the ground, 2,000 tons are at present in the ore houses that would pay to ship East, and 1,000 tons on the dumps that are being worked through the company mill, both classes of which are being replenished by the output of the mine. What the yield has been from any of the ore I have been unable to ascertain. It is estimated by experienced mining men that there are 100,000 tons of ore in sight in the mine.

WASHINGTON BAR.

Washington Bar district has been mined for placer gold for many years and has produced a half million of dollars. This entire placer property, which has the most extensive hydraulic gravel mines in the territory, without question, has lately gone into the hands of the Montana Hydraulic Mining Co., a company with ample means to properly develop the immense gravel banks and work them to their full capacity with proper machinery. It is generally believed they will uncover some of the richest gravel deposits ever found in the west. The company have patents for 7 miles of gulches with gravel bars on either side, 1,500 acres of mineral land, besides some 3,000 acres which they hold by purchase. They have a never failing water supply in volume not less than 3,000 inches, and the gravel prospects 50 cents to the square yard. It has been estimated by experts that the land belonging to this company contains \$50,000,000 of placer gold. They are now engaged in laying a four-foot flume into one mine and a

thirty-inch flume into another and propose to have three giants in operation in a few weeks. This is the first attempt made by capital to take hold of and work on a large scale the heavy auriferous gravel deposits of the county. Heretofore the mines have been worked on a small scale, and it is thought the success of this enterprise, of which every one is sanguine, will give a new impetus to that class of mining in the county. The quartz mines of the district, located at the head of the gulches referred to, have only attracted attention the last two or three years.

THE CLIMAX, GOLDEN FLEECE AND BONANZA CHIEF.

The ledge which seems to be most thought of by the miners of the camp and in which most confidence is placed, is located on North Baldy, covers three full claims of 1,500 feet each, and is known as the Golden Fleece, Climax and Bonanza Chief. The ledge is in granite, runs with the formation, as all gold leads should, and contains some of the richest gold rock I have ever prospected. It is beyond question the main ledge of the mountain and can be traced the entire distance of 4,500 feet. The only drawback to this mine is its inaccessible locality. It is near timber line as well as perpetual snow, and will cost considerable to reach with a wagon road. There has been a tunnel run in on the Climax vein 150 feet, the entire distance showing up a fine vein 5 feet wide, containing $3\frac{1}{2}$ feet of very rich ore, composed of white quartz spotted with oxide of iron and a little galena, considerable honey-comb rock appearing here and there in the vein. The ore assays \$100 gold, 14 ounces silver, and 10 per cent lead and 20 per cent iron. The Golden Fleece, on the same ledge and adjoining the Climax, has about the same characteristics. A fifty-foot tunnel has been driven on this mine, disclosing a strong, uniform, well defined vein 8 feet in width with 6 feet of pay ore, assaying \$115 per ton gold, 17 ounces silver, 10 per cent lead and 25 per cent iron. Adjoining and on the same ledge is the Bonanza Chief, which has also the same character of the two former and on which a tunnel has been run 30 feet, showing up a 6 foot vein with 4 feet of pay ore that assays \$100 gold, 12 ounces silver, 10 per cent lead, and 20 per cent iron. The three claims belong to the same owners and they estimate that they have 2,500 tons of ore on the dumps that will pay to ship were there a railroad near by. They also report 20,000 tons of ore in sight.

which I suppose will be shipped to a smelter for reduction. There has been quite a large amount of development work done on the mine. Shaft No. 1, which is a double compartment, has been sunk 250 feet, shaft No. 2, 80 feet, shaft No. 3, double compartment, 140 feet, from which levels have been run as follows: No. 1, 480 feet; No. 2, 200 feet; No. 3, 100 feet. The vein in shaft No. 1 is 14 feet wide; in shaft No. 2, 12 feet wide, and in shaft No. 3, 7 feet wide, three-fourths of which in each case is pay ore. Considering the width of the vein the waste is slight. The ore is honey-comb quartz with spots of peroxide of iron. In much of the ore the iron has disappeared, only leaving the stain. There is so great a range in the grade of the ore coming from different portions of the vein that it is impossible to give an average value without a pulp sample, which I have been unable to obtain. Ore from the several faces in the openings assayed from \$25 to \$1,200 per ton. There have been 2,000 tons of the ore shipped to Eastern works, 1,000 tons worked by the company's mill on the ground, 2,000 tons are at present in the ore houses that would pay to ship East, and 1,000 tons on the dumps that are being worked through the company mill, both classes of which are being replenished by the output of the mine. What the yield has been from any of the ore I have been unable to ascertain. It is estimated by experienced mining men that there are 100,000 tons of ore in sight in the mine.

WASHINGTON BAR.

Washington Bar district has been mined for placer gold for many years and has produced a half million of dollars. This entire placer property, which has the most extensive hydraulic gravel mines in the territory, without question, has lately gone into the hands of the Montana Hydraulic Mining Co., a company with ample means to properly develop the immense gravel banks and work them to their full capacity with proper machinery. It is generally believed they will uncover some of the richest gravel deposits ever found in the west. The company have patents for 7 miles of gulches with gravel bars on either side, 1,500 acres of mineral land, besides some 3,000 acres which they hold by purchase. They have a never failing water supply in volume not less than 3,000 inches, and the gravel prospects 50 cents to the square yard. It has been estimated by experts that the land belonging to this company contains \$50,000,000 of placer gold. They are now engaged in laying a four-foot flume into one mine and a

thirty-inch flume into another and propose to have three giants in operation in a few weeks. This is the first attempt made by capital to take hold of and work on a large scale the heavy auriferous gravel deposits of the county. Heretofore the mines have been worked on a small scale, and it is thought the success of this enterprise, of which every one is sanguine, will give a new impetus to that class of mining in the county. The quartz mines of the district, located at the head of the gulches referred to, have only attracted attention the last two or three years.

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THE LITTLE KID.

The Little Kid is a promising mine north of the Climax. Considerable work has been done on this mine. Thirty tons of the ore have been shipped to Wickes smelter, which give a return of \$108 per ton. Twenty-three tons worked on the ground by arastra, gave a yield of \$25 per ton. There has been a tunnel run a distance of 105 feet cutting the vein at 75 feet, from thence following the same. From the end of the tunnel and incline a shaft has been sunk 50 feet on the vein and a level 40 feet in length has been run from the shaft. A second tunnel 40 feet in length has also been run. The vein runs from 6 to 12 feet wide in the several openings, and it is claimed to be all pay ore between the walls. The ore is pyrites and mono-oxide of iron that will concentrate to good advantage. The assay value of the ore sampled from full width of the mine is \$33 gold and 2 ounces silver. The ore shipped was packed out a distance of 5 miles on horse back, over a very rough trail. The gross yield of the mine has been \$4,250. Most of the ore mined still lies on the dump. The Chilro has a shaft 75 feet in depth, and one 50 feet in depth, showing a vein 4 feet wide all in ore, composed of hard white quartz, containing \$12 in free gold.

THE CHANCE AND LAKEVIEW.

On South Baldy there are quite a number of promising ledges and notably so the Chance. This ledge has been developed very little, principally on account of its being so inaccessible. It is some distance above timber line and a portion of the ledge is covered with immense banks of perpetual snow. Were it at a lower altitude, I think it would have long ago been one of the most noted mines of Montana. The vein is horizontal and seems to cut the mountain like slicing off the top of a pine-apple cheese. The vein lies with the formation. The ore is white flinty quartz, some of it porous, with iron stain, and is the nearest a free gold mine that I know of in the district. The ore assays \$62 gold and 2 ounces silver to the ton. There is a tunnel in on the vein 40 feet, which is still in frozen ground and it is thought by some that the mountain at, above, and some distance below the line of the lead, is frozen through, which, from the fact of the frost being 40 feet deep as known, would lead one to believe the theory correct. We all know it can not, even at a lower altitude, thaw down 40 feet, and *ergo*, if it is not thawing at that depth, being surrounded with frost, it

must be freezing deeper. Therefore I report this mountain frozen through, without fear of proof to the contrary being produced this summer.

Adjoining the Chance and on the same vein is the Lakeview, which is similar to it in all respects. One hundred feet of open cuts and tunnels have been run in on the vein, which is flat. The pay ore is 18 inches wide of white quartz, stained some with iron, and also containing a little carbonate and galena, though it is a free gold ore and assays \$40 gold and 2 ounces silver.

THE GRAND CENTRAL.

Several miles down the mountain and in a much more congenial clime is the Grand Central ledge, which is a good one if there is any in the county. A tunnel has been driven in along the vein 225 feet, showing a strong, well defined, true fissure vein and it is one of the best prospects for a big mine that I have visited. The vein is large and well filled with a good grade of concentrating ore, that can be reduced by such means to about 20 per cent and still retain all the valuable metals. The ore is white quartz and red iron and assays from \$20 to \$800 per ton. Of course the high assay was from selected ore. Some of the ore has been worked by arastra on the ground, but proved unsatisfactory as it is too refractory to work by such means. The owners are therefore piling up the ore on their dumps awaiting rail facilities.

THE PUZZLER.

The Puzzler, two claims on the same ledge, located on Washington Gulch, have each been sunk on to a depth of 100 feet and show good bódies of free milling ore, assaying \$50 gold and \$80 silver.

THE LAKE.

The Lake, on South Baldy, is a first rate prospect for a good mine, and it is unfortunate that it can not be further developed. The owner, though, is so situated financially that he can not spend money to develope unless he could dispose of the output to advantage, which is impossible under the existing state of affairs. The vein is good width of \$25 ore, 75 per cent of which is gold.

THE ROUGH AND READY.

The Rough and Ready on North Meadow creek has been worked as a free gold mine, the output having been reduced by arastras for the past 20 years. There is an 80 foot tunnel, one shaft 200 feet

deep and one 40 feet deep on the vein. Levels have been driven on the vein 75, 80, and 60 feet in length. The output of the mine has been considerable. The vein is 3 feet wide and the ore assays from \$75 to \$100 per ton in gold. Of late there have been 120 tons of ore worked, averaging \$57 per ton. Owners report 50 tons on the dump that will go \$100 per ton and 75 tons that will go \$50.

The great drawback to the Washington Bar section is this; all the mines are owned by poor men unable to erect proper machinery to reduce the ores. A first class stamp mill with necessary gold saving adjuncts, is all that is needed to make it a lively camp. A smelter with rail facilities of course would be better, but for the present a mill would answer the purpose.

POTOSI DISTRICT.

Potosi district is situated at the head of Willow creek on the east slope of the Tobacco Root range. It is essentially a dry ore camp, though galena and copper appear in some of the veins. There are some very large strong low grade veins as also several very high grade small veins. It is decidedly a silver camp and there is but a small per cent of gold in any of the veins. The general character of the ore is base but most of the product can be handled by a chloridizing mill to advantage.

THE BULLION.

The Bullion has had considerable development work done upon it, the vein is a strong one though the pay ore as yet is narrow, varying from 6 inches to swells of 3 feet. Several shipments to Wickes and Omaha smelters have been made yielding on an average 119 ounces of silver per ton. The ore was packed out on horses for a distance of 10 miles, there being no wagon road to the camp. The character of the ore is black sulphurets and zinc with a quartz gangue.

THE CROWN POINT.

The Crown Point has been developed to some extent; the ore is gray copper and zinc. It has a 7 foot vein well filled with ore that samples 58 ounces in silver, not rich enough to pack out and haul by team, though with a railroad near Pony district, a good wagon road would immediately be constructed into the camp and Crown Point would rival its Nevada namesake. It is a well defined, strong mine, that can be traced a long distance.

THE ST. LOUIS.

The St. Louis it is claimed is a wet ore mine, containing enough galena to smelt its product. But little developments have been made, though it promises to show up a good silver-lead property.

THE DICTATOR.

The Dictator is a tremendous ledge of low grade silver-lead ore. It samples low in both silver and lead but is one of the best concentrating propositions I have examined and can be jigged from 8 to 10 tons into one without losing any metal of consequence, making a product worth from \$80 to \$100 per ton. The vein is full 50 feet in width of a uniform class of ore. It is unnecessary to say anything further of the Dictator; the above facts determine it to be a mine in the full meaning of the term.

THE GREEN JACKET.

The Green Jacket is one of the best showings for a big property in the district. The vein is eight feet wide, producing a very regular grade of silver-lead carbonates and gray copper ore with quartz gangue. The owners intend to thoroughly develop and explore this property without delay. It can be put in shape to be one of the greatest producers in the county.

THE KEYSTONE.

The Keystone has been worked to quite an extent, the output is gray copper, antimonial silver with a white quartz gangue. There are 100 tons of ore on the dump. The vein is large, strong and well defined.

THE VOLUNTEER GROUP.

The Volunteer Group in the same district consists of 12 full claims of 1,500 feet each, on all of which more or less development work has been done. The deepest shaft is 87 feet and the longest tunnel is 50 feet. It is a silver property, the ore being antimonial silver with a decomposed or soft quartz and porphyry gangue. One of the veins is 40 feet wide while another is 60 feet, while still another shows ore for a width of 180 feet. Of course when the veins are so wide they are necessarily of low grade, but as it will jig well, desirable concentrates can be made from either of these large mines. The whole group have excellent possibilities, though as the owners are poor men it can be seen at a glance that they have no business attempting to develop a mine that will take a cross-cut of 180 feet to prospect.

THE EDISON.

On the Edison lode in the same district the owners are running a tunnel to tap the mine which they expect to cut 180 feet from the surface. They have 40 feet more to run. On the surface the vein is 3 feet wide well filled with 60 ounce silver ore of a carbonate and antimonial character with a quartz and porphyry gangue. It is asserted by the mine owners of Potosi district, that they could and would mine 1,000 tons of ore a day that could be reduced by jigging on the ground to 300 tons, producing a product worth \$150 per ton, if there was a railroad on Upper Willow Creek valley by which they could ship to a smelter.

IRON ROD AND SILVER STAR DISTRICTS.

These districts are situated west of the Jefferson river in the Red Mountain range in Madison county. The Iron Rod mine has been worked almost continually since its discovery in 1866 and the explorations have now attained a depth of 600 feet. The ore of the upper levels has all been stoped out and the 600 foot level is now supplying the output. Just how much ore and gold the Iron Rod has produced in the past 22 years I have been unable to ascertain as it has been worked by several different companies, but from all I can gather I am confident it has not been less than a quarter of a million of dollars. It has been one of the most steadily paying properties in the county. The ore heretofore has been worked in the company's mill near the mine, though the fact has been known for years that they were not saving more than 60 per cent of the value of the ore, therefore at present, the best class of ore that is being taken out is shipped to Butte by wagon teams. Butte being a distance of 50 miles from the mine is proof positive that the Iron Rod is producing a high grade of ore. The vein is not large though uniformly filled with ore of an iron character and quartz gangue.

THE GREEN CAMPBELL.

The Green Campbell, situated in the Silver Star district, is a very wide, low grade, free gold ledge, in a contact of lime and porphyry. This mine in early days produced a large amount of quartz from which came not less than \$1,000,000 in gold. It is said that there are chambers worked out in the Campbell that a six-horse team and wagon could be easily turned round in. The ledge is the property of a Buffalo company who have allowed it to lie idle for several years.

THE BROADWAY.

The Broadway is another contact vein, low grade but immense in width. For years and until the property fell into the hands of a London company the Broadway was one of the largest producers in Montana, and prior to which time the owners had received \$300,000 from the output of the mine. The ore is a soft or decomposed quartz, mixed some with porphyry, easily mined and crushed and containing from \$10 to \$14 per ton in free gold, readily saved in a wet crushing mill on copper plates. The expense, therefore, was light for mining and crushing. I am informed however that all the large bodies of free ore from both the Broadway and Campbell have been mined out. Whether greater depth and further explorations would disclose more such ore bodies, can not be discovered without a large expenditure of money.

Taking it from the inception of quartz mining in Madison county, Silver Star has produced as much if not more, quartz gold than any other camp in the county. Most of the ore in the district is a dry ore, with very little other, save the metal royal in the quartz, therefore it is neither a concentrating or smelting camp; but there are many low grade large veins as also many high grade small veins in the district that will pay to work, and will be worked and give employment to hundreds of men so soon as a railroad shall have "waked us up." I have myself seen a large washbowl full of gold the result of a week's run of ten stamps on ore from this district. I also know of \$12,000 having been pounded out out from quartz of a ledge of the district, with a hand mortar, all of which convinces me that Silver Star is not extinguished but only under a cloud.

VIRGINIA CITY AND VICINITY.

Madison county is one of the largest gold producing counties in the territory. Most of the product has heretofore come from the placers, though the gold-bearing quartz mines with present developments promise in the near future to outstrip the placers. The gold product for 1887 was larger than it had been for many years previous. The United States assay office, at Helena, in reporting the gold product of Montana to the director of the United States mint, places the gold product of the county of Madison for the year 1887 at \$1,500,000, the largest part of which came from the famed Alder Gulch and vicinity of Virginia City. From a careful estimate, after securing all the information pertinent

thereto, I conclude, that Alder Gulch has produced since its discovery in 1863, \$100,000,000 in gold. This with the fact that it is still producing \$1,500,000 a year is conclusive evidence that the quartz veins which rib the mountains on either side of the gulch from head to mouth, must contain vast stores of quartz gold. There are 12 large mining flumes being operated in the gulch, besides many smaller works employing several hundred men, mostly white, Chinamen only working in the lower or less rich portion of the gulch. In connection therewith I can report, without fear of contradiction, that every man in the gulch that is mining is making money.

THE PROSPECT QUARTZ MINE.

The Prospect Mine, lying in the west mountain from Alder Gulch and one mile from Virginia City, has been explored and developed to a greater extent than any vein in the vicinity. At the base of the mountain there has been a tunnel driven along the vein for a distance of 400 feet, with a free showing of ore both overhead and underfoot. About 500 feet from the base of the hill there is a second tunnel driven 450 feet along the vein, uncovering good ore the entire distance. Still 400 feet above a third tunnel has been run with the vein a distance of 300 feet, and, as in the others developed the same uniform grade and character of ore. Some very rich ore has been taken out of the tunnels, which was shipped to Dillon by wagon, a distance of 50 miles, thence by rail to Omaha, Butte or Denver, several of the shipments going as high as \$300 per ton. This ore, however, was assorted out of many hundred tons of low grade ore and the chief value of the mine lies in the large quantities of low grade ore that it will produce, and that will not bear the present cost of shipping. The mine was operated under a lease by the New York and Montana Company for a few months during the summer of 1887, and I am informed that they extracted from the mine 800 tons of ore that produced \$20,000, the ore having been worked in the company's dry crushing mill in the vicinity. I can also report that there are large bodies of just such ore as that crushed, still uncovered in the mine, and that it was not for a lack of ore that the lease terminated, but from the fact that the owners of the mine did not desire to continue the same.

THE ALMEDA.

The Almeda, situated a short distance from the Prospect, has been worked successfully for several years by the New York &

Montana Company, the output going to their mill for reduction, which is a chloridizing dry crusher. I have been unable to learn the yield of the mine or value of the ore, as it is the policy of the company to keep its business to itself; however when the mill is in operation, two bars of silver bullion weighing from 70 to 80 pounds, are shipped each week and as the bars have a decided gold cast it is supposed they are worth not less than \$3 to \$5 per ounce. There is a shaft on the mine 400 feet deep which is now being extended to the 600 foot level, it being the purpose, I understand, to cross-cut to the vein when that depth is reached. The vein above the 300 foot level has been stoped out. The mine is not a wide one, but is strong and permanent. The ore is of good grade, I am told never yielding less than \$100 per ton.

THE SILVER BELL.

The Silver Bell mine, just over the mountain, is one of the most promising mines in the county. As the name indicates it is a silver property. The vein is from 20 to 80 inches in width, well filled with a uniform grade of ore, which is of the dry character, containing antimonial silver, black sulphurets, sulphide and oxide of iron, a little copper pyrites, with a quartz gangue. There have been 300 tons of the ore worked at the New York & Montana Co.'s mill, which yield \$30.55 per ton. The gross yield of the mine has been over \$9,000. There are 400 tons of ore on the dump, assaying from \$30 to \$100 per ton, which will pay well to work on the ground with suitable machinery, or to ship with proper transportation. The vein is being further developed at the present time with a force of men. There are 700 feet of tunnels on the mine, from which have been sunk one shaft 80 feet deep and another 40 feet deep. The ore works readily by the chloridizing process, but the price asked (\$24 per ton) by the mills near by for reduction is thought to be unreasonable by the owner of the mine, and he is therefore storing the output at the mine, waiting for something to turn up.

THE U. S. GRANT.

The U. S. Grant mine, one mile above Virginia City, on the west mountain from Alder Gulch, has a tunnel 400 feet in along the vein, at the end of which a shaft has been sunk 150 feet. A second tunnel has been driven along the vein 90 feet, throughout which openings the vein shows to be strong and well defined, from 4 to 8 feet in width, averaging 3 feet of pay ore, which samples

from \$34 to \$50 per ton, and there is a large amount of such ore in the mine (estimated by experts at 25,000 tons). The ore contains gold and silver in proportion of two of the latter to one of the former. The gold is free and some fine specimens have been obtained from the mine. The silver is found in the native, in the chloride, black sulphuret, and ruby forms. The ore also contains iron, both sulphide and oxide. The gangue is jasper and white quartz. There have been two shipments of assorted ore made from the mine to the smelter at Omaha; one went \$230 and the other \$160 per ton. One run of ore from the mine was made by the New York & Montana Co.'s mill, which yielded \$82 per ton. There are 400 tons of such ore on the dump. The mine is conditioned to produce 20 to 30 tons of such ore a day and is now being worked.

THE EL-FELED A.

The El-Feleda ledge is a silver-gold mine higher up on the mountain. A tunnel 250 feet in length has been driven along the vein; openings have also been made at different intervals along the entire length of the claim of 1,500 feet, showing a remarkably well defined fissure vein from 6 to 15 inches in width of pay ore, which samples \$36 in gold and \$63 in silver. The ore contains free gold, chloride of silver and black sulphurets and a small per cent of carbonates, and is well suited for a chloridizing mill. There have been 25 tons of the ore shipped to Salt Lake for treatment, which netted \$60 per ton, and 20 tons of selected ore have been reduced in the vicinity, which yielded \$120 per ton. The owner writes, "To develop and improve the mine has been my object in the past, without regard to immediate profit."

THE I. X. L. LOD E.

In the same vicinity is the I. X. L. lode, one of the early day mines of the camp, which has produced some very fine specimens of free gold ore. Shaft No. 1 on the vein has been sunk 30 feet, in which the ore is 5 feet wide, sampling \$18 per ton. Shaft No. 2, 90 feet deep, width of vein 3 feet, from which assays have been obtained of 100 ounces silver and \$30 of gold to the ton. Shaft No. 3 is 45 feet deep, vein 4 feet wide, which samples 60 ounces silver and \$8 gold to the ton. A tunnel is now being driven into the mountain for the purpose of cutting the vein at a depth of 300 feet which has reached a distance from the mouth of 450 feet; there are 150 feet yet to run.

THE BLACK LEDGE.

Brown's Gulch, which puts into Alder a mile below Virginia City has a great number of very promising silver mines in the mountains on either side, from head to mouth. Among others, the Black Ledge is one of the strongest and largest mines in the county, and has been well developed by tunnels and shafts. The ore is blue, black and gray sulphurets of iron, with a silicious gangue. It can be reduced by concentration about 80 per cent, making a product worth about \$80 to \$100 per ton.

THE UTAH NORTHERN AND SPRATT.

The Utah Northern, Spratt, Black Eagle, and many other mines in the vicinity, have been well developed and all contain large bodies of ore of the same general character as the Black. The ore, however, is refractory, not very high grade and therefore can not be worked profitably without railroads or smelters in the vicinity; though they are just that class of mines on which a railroad could largely depend for tonnage, and it is only a question of cheap transportation, to change the dormant condition of these mines to that of dividend paying properties. The owners of these mines propose to guarantee 50 tons of concentrates per day for shipment, with a railroad at any point along Alder Gulch.

THE JESSE MORGAN MINE.

The Jesse Morgan, also on Brown's Gulch, is being developed by a Minnesota company with very encouraging results. That the mine is a good one there is no longer a question of doubt. Tunnels have been run along the course of the vein a distance of 250 feet in length, entering the mountain 1,100 feet below the apex. Numerous cross-cuts and levels have been driven, from 65 to 150 feet in length, the vein in every opening showing to be a strong one, well defined, in solid granite walls. The ore is not the same in all of the openings; at some points it is sulphides, at others it is chlorides. Assays have been obtained of \$25 gold and 82 ounces silver to the ton. An average lot of ore was worked in the New York & Montana Co.'s mill for a test, that went \$40 per ton. There is quite a large amount of ore on the dumps. The superintendent writes, "It is the wish of the company to erect a plant for the reduction of the ores, but much will depend on the facilities of transportation."

THE SUNRISE LODE.

The Sunrise Lode, in the same section, is galena and carbonates in a white quartz gangue, carrying 60 ounces of silver. One shaft 100 feet deep has been sunk on the vein, showing 5 feet of ore. Another shaft is 60 feet deep with a 3 foot vein, and still another 60 feet in depth, with a 6 foot vein. There have been 60 tons of the ore worked at Salt Lake, and there are 1,000 tons of the ore on the dumps ready for shipment.

THE GOLDEN GATE.

The Golden Gate mine is near by, on which a tunnel has been run cutting the vein at a depth of 75 feet, at which point the pay ore is 5 feet wide, assaying \$30 gold and 20 ounces silver. In this as in the Sunrise the general character of the ore is galena and carbonate.

THE HIGHLAND CHIEF AND MOUNTAIN FLOWER.

The Highland Chief and Mountain Flower, two full claims on the same vein, have 127 feet of tunnels. The vein is a strong one, crops for a long distance, and is five feet wide. The ore is white quartz containing free gold, spotted with antimonial silver and iron, and assays, irregularly, all the way from \$14 to \$530 per ton. The irregularity is caused by the spots of mineral in the rock. Thirty tons of the ore have been shipped east, which netted to the owner \$46.50 per ton. Twenty tons of the ore have been worked by free mill in the county, giving \$11 gold per ton. There are 500 tons of ore on the dumps. The output of the mine could be increased to 50 tons per day, were there cheap transportation at hand. It is considered one of the most promising properties in the neighborhood.

THE BELL MINE.

The Bell mine, in Linder mountain, two miles above Virginia City, has a tunnel driven into the mountain along the course of the vein, for a distance of 800 feet. Several cross-cuts have been made at different distances from the mouth of the tunnel and the vein is found to have an average width of 25 feet, filled with a uniform grade of ore; the grade however is low, but its good width makes it a valuable property and one that would add no inconsiderable amount to the tonnage of a railroad. The ore body developed is 800 feet in length, 25 feet in width and 300 feet in depth. A test run of the ore in a free gold mill went \$8 per ton. The ore assays from \$15 to \$20 per ton.

THE COOK AND PRASCH MINE.

This mine, located on Williams Gulch, near Virginia City, is being worked, under a lease, by the New York & Montana Company. The ore is being reduced in the company's chloridizing mill at this place. No great depth has as yet been attained on the vein, but judging from surface indications and the amount of ore now being delivered at the mill from the mine, convinces me that it will be a great producer, when sufficiently opened, to give places for men. The ore is a combination of carbonate, galena and iron, containing from 30 to 40 ounces of silver to the ton. The ore contains rather too much lead to work in a roaster, but will jig advantageously, and make a very high grade of concentrates.

SUMMIT DISTRICT.

This district is at the head of Alder Gulch, eight miles above Virginia City. It is generally conceded that a large part of the many millions of gold taken from the gulch came from leads in this district. Chief among them is the Oro Cache, which has not only helped feed the gulch, but has produced from surface quartz \$1,500,000 in gold. Years ago when the vein was uncovered in the several openings, it showed to be an exceedingly strong one, but was stoped and gouged out down to the barren zone, a point believed to exist in all gold mines; and which point once passed, as the top ore was valuable, so comparatively rich ore will in almost every instance be found below such barren zone. To the present time Madison county has been so unfortunate as to be without citizens enterprising enough to sink below the barren zone, which has been found in the free gold mines at the head of the gulch. That some one will come, with capital and nerve sufficient to penetrate beneath this zone is the prayer of the quartz miners of the camp. For such an one every miner in the gulch believes there is in store down in the depths of the veins, at the head of the gulch, gold in quantities, to which that taken out of the gulch is comparatively a mere pittance. Call this a Utopian dream if you will, but the evidence to lead the miners to believe as they do, can not be termed visionary. The gulch was pregnant with gold unquestionably coming from the leads, getting coarser and more plentiful as the gulch was ascended; all the hills and bars and sags around the veins contained much gold. The ledges themselves are among the strongest, largest and best defined in Montana and have pro-

duced millions of dollars in free gold, from the surface down to the barren zone, and when that point was reached, still showing to be as strong, well filled and defined, though not containing the free gold found higher up in the veins. In Colorado nothing was thought of going through 200 or 300 feet of a cap, containing *nil*, while never has there been a hole sunk 25 feet in the barren zone of a lead at the summit of Alder Gulch. The ledges of Summit are gold bearing and very little silver is found in the ore.

THE J. T. C. MINE.

The J. T. C. and Randolph are two full claims on the same vein. During the past winter two tunnels have been driven into the mountain, a distance of 285 feet each, at right angles with the vein, cutting the same at a depth of 150 feet. This ledge has been traced by surface croppings and shafts a distance of three miles, and shows to be a mammoth mine of low grade ore. In many openings the vein is 50 feet wide, and while the ore is low grade, for the entire width it is of a uniform value. At the points where the tunnels cut the vein it is 25 feet wide, filled with ore of the general character found at that depth in the district, viz., sulphurets of iron and soft quartz gangue, which can be reduced from six tons into one by concentration, making a product of almost pure iron, that by actual test is known to contain \$65 in gold. With the facilities for transporting at hand, this is too low grade to work profitably. The owners, however, have informed me that they will enter into contract to furnish 25 tons per day of concentrates for shipment to a railroad building to any point in Alder Gulch. This would require an output from the mine of only 150 tons per day, while 500 tons could be easily produced from the openings on the mine. As I have said it is a low grade mine and the question will naturally occur, will the mine pay, even with a railroad. To settle such matter I will make an estimate of the cost of mining, transportation and working, and the value of the ore when mined. I wish to say as to the value of the ore and its adaptability for concentration, the facts have been obtained by actual test and are absolutely correct. This estimate can also as well be applied to other large low grade mines reported upon herein.

Cost of mining six tons of ore from 25-foot vein.....	\$12 00
Concentrating six tons of ore, at the mine.....	6 00
Hauling one ton of concentrates to railroad.....	1 50
Railroad transportation on one ton of concentrates.....	12 00
Reducing one ton of concentrates at smelter.....	14 00
<hr/>	
Total expense.....	\$45 50
Gold contained in one ton of concentrates.....	65 00
<hr/>	
Balance profit to mine owner.....	\$19 50
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Say the mine produces 25 tons of concentrates per day (the amount the owners propose to bind themselves to furnish a railroad); this would leave a daily profit of 25 tons at \$19.50 per ton, or \$487.50, which amount would be profit with a railroad near by, and which amount would be absorbed in wagon transportation were the concentrates shipped under the present condition of things.

THE APEX AND MINSTREL.

The Apex and Minstrel are on the same ledge as the J. T. C. and Randolph and are of the same general character. These claims show in many places a vein 50 feet wide. Considerable surface work has been done on both mines and one tunnel has been run a distance of 150 feet. The surface rock is free gold of low grade, that changes into base as depth is attained. I feel confident that these mines will prove to be excellent concentrating properties, equal in every respect to the other mines on the ledge. There are about 600 tons of ore on the dumps and 15,000 tons above the lowest openings. A small test run of 9 tons of ore has been run in a free gold mill which resulted in \$10 per ton. These mines are just such as could be made to furnish tonnage for a railroad. This fact I wish to impress upon you that while they are not rich, they contain sufficient gold to profitably concentrate and ship, and are capable of furnishing enormous quantities of ore at small cost of mining.

THE KEARSAGE.

The Kearsage, which is thought to be by some, a spur from the above ledge and by others to be on the same vein, in early days was one of the most noted mines of the territory. Like the Oro Cache, it was fabulously rich on the surface in free gold quartz,

easily reduced. It produced over a million dollars in gold before the barren zone was reached. Nothing has been done on the mine for years, and it practically lies as it did in 1866, when the miners gouged out the last ton of ore in sight that showed free gold to the naked eye. It was timbered poorly, the openings soon caved in, and so it remains to-day. It was a grand mine in its time and I believe will be again when properly developed.

THE BARTLETT.

The Bartlett, in the same locality, is a large vein showing to be 15 or 20 feet in width. No great amount of development has been done upon it. As far as uncovered, the ore is gray and white quartz, with spots of liver-colored iron, a little sulphides and a piece here and there showing copper indication. There is no silver, and the gold contained in the ore is free. If there is a free milling proposition in the camp the Bartlett is the mine. However, it is thought that when the water level is reached, the ore will be base and consequently change into a concentrating ore, as others have of the district. Should this prove true and the ore retain its present value, it would be a considerable factor in supplying tonnage for a railroad. The ore assays from \$6 to \$40 per ton. One hundred tons of the ore have been worked in the county by free mill, which yielded \$7.30 per ton.

THE KEYSTONE.

The Keystone is a narrow mine of base gold ore, from one to two feet in width, sampling \$30 per ton. This mine has been worked at intervals for the last 20 years, and has produced \$60,000 in gold. Were there facilities for working the ore near by or cheap transportation at hand, it could be mined profitably. There are 350 feet of tunnels and 285 feet of shafts on the mines and quite a large amount of stoping has been done.

THE MUGWUMP.

The Mugwump lode on the same hill has a shaft 40 feet deep, showing a vein 4 feet wide. A sample cut from the full face assayed 30 ounces silver and \$18 gold to the ton. The vein has the appearance of developing into a good property.

THE SNOWCAP AND GLORY OF THE FOURTH.

Near the summit of Old Baldy, at the very head of the gulch and on the line of contact of the granite and lime, is the Snowcap lode. There are four distinct veins or crevices on the ground, though they all seem to belong to the same ledge. The three next to the granite, are granulated sandy quartz, containing free gold, assaying as high as \$75 per ton. The vein next the lime is lead carbonate, carrying 70 ounces in silver. The core, or matter between the veins, is manganese, which is a very peculiar combination for a quartz ledge; granite and gneiss for one wall, gold ore, manganese core, then silver carbonates with lime for a hanging wall. The owners are now erecting a free gold mill with which they intend working the free gold ore from the mine. The carbonates will be stored for shipment. They have 400 tons on the dumps ready for shipment, and estimate to have 1,000 tons uncovered in the mine. There is a tunnel 350 feet on the vein besides a number of shafts and levels. The Glory of the Fourth, on Oro Cache mountain, has a three foot vein of free gold ore assaying \$100 per ton, the ore from which will be reduced in the Snowcap mill.

PROBABLE TONNAGE IN ORE FOR A RAILROAD.

From minute inquiry and thorough examination I conclude that the mines in the immediate vicinity of Virginia City could furnish with present openings tonnage per day to a railroad, as follows: The J. T. C., Randolph, and other mines at Summit, 150 tons. The U. S. Grant, Silver Bell, Prospect, El-Feleda and other mines, Alder Gulch, 250 tons. Mines at Brown's Gulch, 150 tons.

THE MAMMOTH AND GRAND CENTRAL GROUP.

On South Boulder, just over the divide from the Pony properties, and conceded to be a continuation of that belt of ledges, is the Mammoth Group of mines, five patented claims and consisting of the Mammoth and Leviathan, full claims and on the same vein, and the Grand Central, Boulder and Ready Cash, also full claims, and on the same vein. As a first class concentrating proposition I know of no group of mines in Montana that surpasses this property. The monster size of the veins, their locality and facilities for operating on a grand scale can not be excelled. The Mammoth is an immense quartz dike, towering above the face of the mountain 100 feet, and is more nearly like the famous Homestake of the

Black Hills than any mine that I know of. When it comes to be operated properly, it will be more like quarrying down a mountain than blasting and timbering a mine. This mass of ore is white and yellow quartz, with stringers of honey-comb rock cutting the stratum in every direction. On the surface the stringers are rich in free gold and many of them were "creviced" out by the early owners of the mine, who found this class of mining very profitable. There has been a tunnel driven into the mountain at right angles with the ledge, which, at a distance of 100 feet, cut the foot wall and was extended into the quartz some 12 feet. The ore at this point contains some iron and a little copper. The mine was experted last summer and samples taken from every portion of the vein, which by analysis gave \$35 gold, 5 ounces silver, 10 per-cent iron and 6 per cent copper, to the ton.

THE LEVIATHAN.

The Leviathan, although an extension of the Mammoth, is much narrower and produces a higher grade of ore. The vein is compact and solid, between smooth granite walls. The ore crushed in a free gold mill near by ran as high as \$100 per ton.

THE GRAND CENTRAL.

The Grand Central is my idea of the most perfect quartz mine I have ever examined, presenting as it does a solid mass of iron sulphide, some 6 feet in width, incased in perfect walls of granite, with a talc gouge on either, of 6 inches in thickness. The vein has a dip of about 80' west and cuts the mountain, which is almost perpendicular, northeast and southwest, therefore great depth could be obtained by a tunnel driven into the mountain at the base and along the vein. The ore is a fine grain bluish gray iron, which has that lively, rich appearance peculiar to gold ore of that character. The fact of the matter is, it looks as if it would go away up into the thousands, though in this respect it is deceptive, as it is not what can be termed a high grade ore. None of the base ore has ever been tested otherwise than with a free gold mill; by such means \$10 per ton was obtained. The mine has been sampled repeatedly by the best mining experts in the territory, the result of one such test as received from the person by me, gave \$50 in gold, 20 ounces silver and 60 per cent iron per ton. On the surface and for some distance in depth the vein contained streaks of a very fine quality of free milling ore which was mined out and worked in a mill that stands at the foot of the hill on the

creek. The mine is fairly well developed and has every promise of being a great producer were there a mode of handling the output. Immediately at the base of the mountain and within 2,000 feet of the main opening on the mine, flows one of the finest water powers in the county, Boulder creek, with a never failing supply of 3,000 inches of water, surrounded also by an abundance of the finest timber. I consider this one of the very best points in Montana for large concentrating works.

THE READY CASH.

The Ready Cash, an extension of the Grand Central, has not been explored to so great an extent but has every indication of developing into as fine a property. This vein also produces gold-iron ore, though not in such massive form as the Central. However its peculiar character renders it easy of concentration, which readily adapts it for furnace reduction. About six tons of the ore can be put into one, that would assay from \$80 to \$100 per ton.

THE BOULDER MINE.

The Boulder mine has not attained depth sufficient to show base ore, though it is believed it will be only a matter of sinking a few feet when such ore will be uncovered, as all the mines thus far sunk on have run into iron. In the present openings the ore shows to be free, and some fabulously rich samples have been found, while the entire vein contains gold sufficient to be designated a high grade ore.

Located as these mines are, within twelve miles of the roadbed constructed by the Union Pacific Co. some years since through the Jefferson canon, the owners, who are poor men, have from spring to summer, and summer to fall, each year expected the rails to be laid, but patience has become stale and they are tired of it; for lo! these many years the road has been so near and yet so far, and they are still without a railroad.

ROCHESTER DISTRICT.

Rochester District, situated in the McCarthy mountains, is one of the oldest quartz camps in the county, and has been worked in a small way successfully for years. The Watseka and Julia Holmes have produced quite a large amount of gold from free ore. The ore was free milling on the surface, but soon became base. For the last several years the output has been shipped east or to Butte. A large flow of water was encountered last summer in sinking to

a lower level and work was suspended awaiting the erection of a hoisting and pumping plant, which is at present being placed, preparatory to working the mine vigorously.

Several copper-men from Butte are pushing work on a copper prospect in the camp that is thought to be equal to the best ledges of the Butte copper belt. They find the same indications and manganese walls that are found on the Anaconda and extensions, and it is thought by the miners of the camp that a second Butte copper belt will be unearthed in this district. Should this prove to be the case, Rochester will not have to wait long for a railroad.

A ledge called the New Mine, is a most excellent prospect. Three shafts, 50, 60 and 75 feet in depth have been sunk, and 75 feet of a level run. The vein is 2 feet wide, of ore assaying \$75 gold and 10 ounces silver to the ton. One hundred tons of ore have been shipped from the mine and 50 tons worked in the county, which gave a gross return of \$9,000. There are 100 tons on the dump ready for shipment.

THE EMMA MINE.

The Emma mine in the same district has shipped 10 car loads. The Owsley mine, 8 car loads. The Watseka and other mines 25 car loads, east and west, the past season.

HAVANA DISTRICT.

Havana District, east of the Madison river in Madison county, is a silver camp, and from time to time for the past 15 years has attracted considerable attention. I was unable to get reports from but one lead and was unable to visit the district. The Pilgrim mine has a double compartment shaft, down 120 feet, over which is erected the latest improved hoisting machinery. Levels have been run east 216 feet and west 257 feet on the vein, which is 36 inches wide, filled with mono-oxide of iron and a silicious iron gangue; it is therefore a dry ore, containing 25 ounces of silver and \$19 gold to the ton. One hundred and fifty-seven tons have been shipped to the Omaha and other smelters, over the N. P. R., which yielded from \$42 to \$91 per ton. The gross return from the 157 tons was \$10,595.64.

THE MADISONIAN MINE.

The Madisonian mine, near the Madison canon, has probably produced as much ore as any mine in the county. From an early day to within a couple of years, the mine was worked continuously

and had it not been for the great flow of water encountered at the 400 foot level, the mine would be in operation at present. Water made its appearance in the mine near the surface, steam pumps were erected, and increased in size as greater depth was attained, but finding the water became too strong and as the ore was never but low grade, the company did not feel warranted in erecting heavier machinery and consequently the mine is idle and full of water. All of the ore above the 400 foot level has been stoped out. The vein is from 5 to 8 feet wide, soft quartz, containing from \$10 to \$15 per ton free gold. The gross output of the mine I have been unable to learn, but I know that a 10 stamp mill was running on ore from the mine almost continuously for 15 years. The ore in the bottom of the 300 foot level was about the same character as on the surface and contained about the same amount of gold. I understand the expense of freeing the mine of water was as great as the entire other expense combined.

PLACER MINING.

Placer mining is carried on to a considerable extent, in Bivins Gulch, where there are four fluming companies at work; also in Harris Gulch by three companies; Bachelor Gulch by two companies; Barton Gulch, two companies; Idaho Gulch, two companies; Brown's Gulch, two companies; Norwegian Gulch, two companies; Hot Spring Creek, two companies; and Parker Gulch, one company; all of which are doing well. As a proof that all the placer mines in the county have not yet been found, I will mention the fact that two Swedes, who had been chopping wood at the head of one of the mining gulches during last winter, started out in the spring to hunt diggings. Nothing was heard of them until a few days since when they came in with quite a large amount of gulch gold, two pieces in the lot worth fifty odd dollars each. This was washed out, I am told, from a gulch near Virginia City that had not been claimed.

THE PLIOCENE CHANNEL.

There is a Pliocene Channel, or gravel stream, extending a distance of 40 miles, through Madison county. This ancient river bed traverses the highest mountains of the Tobacco Root range, and the gravel of the channel all contains gold. Bedrock has never been reached at any point along the channel; although the attempt has been made repeatedly to sink on some of the highest mountains through which the channel passes, the great flow of

water in the channel has prevented a greater depth than 100 feet being attained. Some very beautiful coarse gold is found in places along the channel. There is a company at present engaged in driving tunnels at different points into the gravel range, as it is called, and great hopes are entertained that a second "blue gravel lead" will be found, if bedrock in the channel can be reached.

COAL.

In traveling over the county I found there were extensive coal fields skirting the mineral belt. The formation of the Ruby range of mountains is lime and sand stone. There is an area of 40 square miles in this range where numerous coal veins show on the surface, some of which are of great width. Considerable development work has been done on several of the veins and the most encouraging prospects uncovered. The general character of the veins and the quality of the coal improve greatly with depth. It is the opinion of coal men, that this section is one of the finest coal fields in the west. The coal found is of a bituminous character, burns excellently in a stove or forge and can not be excelled for making steam. It is also claimed that some of the veins discovered contain a coal that will coke. This field was experted by an Eastern coal man last summer, and was pronounced by him to be the best coal and the most extensive field in Montana. Of course the distance from a railroad precludes working the mines at present to any extent. In the Madison range of mountains extensive coal fields have been discovered; several veins in that locality are being developed and produce coal of an excellent quality, and smiths and farmers of the valley are using it for their forges and for fuel. The veins are large and lie admirably for mining.

Where the lime sets in just beyond the head of Alder Gulch, flattering prospects of coal have also been discovered and great hopes are entertained of opening up coal mines near the smelting ores of that section of the county.

TIMBER AND MEADOW LANDS.

Along the upper Madison river, in the southern portion of the the county, the mountains and plateaus are covered with vast bodies of pine, hemlock, fir and spruce timber, and there are no other forests in the territory that offer so great a harvest for lumbermen, of course with a railroad within reach. The timber is large, uniformly straight, and free from limbs, and must be the source in the near future of the lumber supply for the mines of the territory.

MINERAL PAINT AND OCHRE.

Below and above this timber country are natural meadow lands, which for yield, variety, extent and quality of the grasses can not be surpassed in the world. For miles one may ride on a good sized horse with the wild timothy, red top, blue joint and bunch grass brushing his feet. Were there a railroad through the upper Madison, transporting this hay to market would be no small item of tonnage. At present there is no market for hay if the grass were cut. In this same locality there are also some of the largest cement beds in the west, as also mountains, almost, of mineral paint, ochre, and many other things of natural wealth.

MICA.

At the head of Granite gulch and within eight miles of Virginia City, several mica veins have been developed during the past year. No great depth has been reached on any of them, though a fine quality of mica has been found and in great quantities. The mica found in these mines is remarkably clear and free from iron or iron stain. The sheets are of good merchantable size. Experts who have examined the mines pronounce the prospect the most flattering for the development of extensive deposits.

FIRE CLAY.

Banks of fire clay have also been discovered and located near Virginia City that are pronounced as good as can be desired.

TIN.

A stock company of eastern capitalists has been engaged for the past two years developing a tin mine on the Ruby range with flattering results. The veins are large and permanent in appearance and the ore assays from 5 per cent to 20 per cent tin to the ton.

ORNAMENTAL STONE.

The variegated sedimentary stone of the upper Ruby, is a very beautiful ornamental rock that can be used for mantels, tables and mosaic floors; many slabs found show every tint of the rainbow and are susceptible of the finest polish.

FISH.

While every stream and brook in the county abound with the finest mountain trout, the lakes at the head of the Madison and Snake rivers are full and crowded with salmon trout, a most elegant fish of salmon color, of from two to five pounds weight. Large quantities of these fish are speared or caught otherwise and hauled to the Butte and Helena markets by team, though the great distance renders the cost considerable and the fish less palatable than they are when taken from the water. A railroad up the Madison would derive quite a traffic from this source.

AGRICULTURAL.

The valleys and benches of Madison county are peculiarly adapted to raising vegetables and the manufacture of butter and cheese. Of course at present butter and vegetables are a drug in the markets, butter being worth but twenty-five cents a pound, and to the product of the county comparatively no sale. As there is no difficulty in raising all kinds of vegetables, simply by the planting, and no mode of transporting to market, the price is necessarily nominal. With transportation near at hand, Madison, Willow Creek, Jefferson, Beaverhead and Ruby valleys could load a train daily with vegetables, butter and other farm products, and not increase the present acreage or dairy facilities. The universal cry from the farmers is, "give us a railroad and we will furnish tonnage that will astonish them." However it is needless for me to report what they promise to do or what they can do. The following statistics in relation to the agricultural resources of the county are absolutely and without question correct, and it requires no great amount of business knowledge or acumen to see at a glance that such resources of the county will furnish ample tonnage to insure the profitable operation of a railroad. This grain, hay and stock is disposed of every year in some manner; were there a railroad in the county, of course that would be the mode of transporting the same to market.

FLOURING MILLS.

There are three flouring mills in the county, one full roller, one roller and buhr mill combined and one buhr mill, with a capacity of 165 barrels per day. During the year 1887, these mills received

for manufacture, 185,000 bushels of wheat, manufactured 36,500 barrels of flour, 2,700,000 pounds of bran and shorts, and shipped by wagon to markets outside of the county, 2,669 tons of flour, feed, bran and shorts.

SAW MILLS.

There are 6 saw mills, equipped with planers, etc., in the county, that manufactured during the year 1887, 1,800,000 feet of lumber and 1,300,000 shingles. Much of this material went out of the county, and was therefore hauled by team.

QUARTZ MILLS.

There are 18 quartz mills in the county, containing 210 stamps, all free gold mills excepting the New York & Montana Co's. mill at Virginia City, and the Carter, new process, mill at Red Bluff. Both the latter mills are meeting with marked success in treating the refractory ores of the county. The New York & Montana Co., however, charge \$25 per ton for reduction of custom ores, and it is only the higher grades of ore that will stand this tax. Larger mills and more conveniently located, of the same class as the New York & Montana Co's. would be a great boon to the mine owners of the county. The free gold mills as well as some 30 arastas are kept at work almost constantly on free ores.

GOLD AND SILVER PRODUCT.

From data obtained from the bankers and express companies of the county, the reports from miners and mine owners, and the report of the United States assay office at Helena, to the director of the United States mint, I am able to report the gold product of Madison county for the year 1887 at \$1,500,000, and the silver product at \$250,000. The amount of cereals, hay, straw, vegetables, etc., that were produced in the county during the year 1887 was obtained from the reports received from each individual farmer in the county, and has been substantiated by information derived from threshing machine owners, as well as by traveling over the county visiting farms, etc., and I am confident in this regard, as in all things else, it is true and correct. I therefore report the product of the county and acreage under cultivation for the year 1887, as follows, to-wit:

I give the values at going cash rates.

Land under cultivation, year 1887, 68,410 acres.

Wheat produced, bushels, 274,865, at 80c.	\$219,892 00
Oats produced, bushels, 1,107,465, at 50c.	553,732 50
Barley produced, bushels, 15,810, at 80c.	12,648 00
Peas produced, bushels, 15,015, at \$1.	15,015 00
Potatoes produced, bushels, 227,700, at 50c.	113,850 00
Cabbage produced, pounds, 867,960, at 2½c.	21,699 00
Other vegetables produced, pounds, 1,164,900, at 2½c.	29,122 50
Hay produced, tons, 48,775, at \$8.	390,200 00
Straw produced, tons, 31,915, at \$4.	12,766 00
Butter produced, pounds, 224,200, at 25c.	56,050 00
Cheese produced, pounds, 4,000, at 15c.	600 00
Beef steers produced, head, 9,370, at \$35.	327,950 00
Mutton sheep, produced, head, 9,600, at \$2.50.	24,000 00
Wool clip produced, pounds, 377,000, at 15c.	56,550 00
Aged horses, produced, head, 8,825, at \$75.	661,875 00
Hogs produced, head, 2,160, at \$6.	12,960 00

Total value of product..... \$2,508,910 00

The number of stock in the county, herewith reported, was obtained from reports received direct from the stockmen; the reports being added, make the following totals:

Cattle all kinds, head, 65,717, at \$20.	\$1,314,340 00
Horses all kinds, head, 39,835, at \$30.	1,195,050 00
Sheep all kinds, head, 70,600, at \$2.50.	176,500 00

Total value of stock..... \$2,685,890 00

The number of acres of land, for which title has been obtained from the United States government, was obtained from the United States land office, and this is the amount of land, also, that appears on the assessor's roll:

Number acres land owned in county, 149,220, at \$10..... \$1,492,200

Improvements on land, town lots and improvements were secured from the assessor's roll, also amount of merchandise:

Improvements on land	\$1,065,825
Town lots and improvements, No. 37,570.	370,200
Merchandise	520,000

There are 50,000 acres of land not included in the above, that is filed and settled upon but for which patents have not issued, and therefore not taxed, which is worth \$500,000.

Grand total of all property in the county, excluding mines of all kinds, as well as moneys and credits, \$9,143,025.

It is estimated by the business men of the county, that the total valuation of all kinds of property, both real and personal, excluding mines, which are not taxed, except at the nominal government price of \$2.50 per acre when patented, and moneys and credits, is not less than \$10,000,000.

TONNAGE OF 1887.

Merchants report to have received, over the Utah Northern and Northern Pacific railroads, in 1887, 3,421 tons of merchandise.

Farmers report to have shipped out 13,855 tons of farm products, all moved by wagon.

There were 100 car loads of beef steers shipped over the Utah Northern railroad and Northern Pacific railroad, to eastern markets, during the year 1887, that were driven from the county of Madison.

Confidence is felt that this report, carefully compiled as it has been, free of prejudice, and guarded against any overestimate in the several totals, is correct, as near as can be ascertained. My great confidence in the magnificent future awaiting the quartz mining industry of Madison county has made my task of examining the mines and writing them up almost "a labor of love," and I have only to say of the mining portion of this report that I have written of no mine that which I believe to be untrue.

Respectfully submitted,

GEO. F. COPE,

Compiler.

INFORMATION FOR HOME-SEEKERS AND EMIGRANTS
AND A GENERAL DESCRIPTION OF MADISON
COUNTY, MONTANA TERRITORY.

The chief reason for compiling these statistics, has been, as the report itself sufficiently indicates, to induce railway building in Madison county. But among the reasons which have actuated the committee and the compiler, another stands almost equally prominent, to-wit: The unprecedented opportunities which the county of Madison offers to prospective settlers and home seekers upon the public domain as well as to capital, ever timid, for safe and profitable investment. True we have no railroads, but the time can not be deferred by any force of circumstances, to any distant day, when railroads will traverse every valley in the county. Lands and mines from the very fact of there being no railroads in the county are low priced and easily obtained, but such a state of affairs can not exist long, and therefore now is the time to secure such property before the inevitable boom which our vast resources will surely bring, shall have come. There is no county in the west offering greater inducements to the miner, farmer, stock raiser and capitalist.

The Madison valley is one of the largest and most productive valleys in Montana. There is yet considerable excellent farming and grazing land vacant in this valley, subject to location under the several land laws. The Willow Creek, Ruby, Jefferson and Beaverhead valleys in Madison county, though more thickly settled, have also large tracts of land that can be had by settling upon and improving. These valleys can not be excelled for productiveness on the globe; 75 bushels of wheat, 100 bushels of oats, 600 bushels of potatoes, 50 bushels of peas, 60 bushels of barley, 3 tons of timothy hay, 5 tons of alfalfa hay, to the acre, being the average yield where crops are well attended. Cabbage, turnips,

beets and other vegetables grow to an enormous size and are excellent in flavor. Strawberries, currants and other berries are very productive. Many of our farmers have set out orchards of apples and other fruits. Last year the most attractive in appearance and finest flavored apples I have ever seen grew on a ranch in the Ruby valley, while at the same time I saw trees the limbs of which were breaking from the weight of the fruit upon them. Of course it takes time to make an orchard, and they are yet rare in the county.

The nutritive excellence of our natural grasses is well known far and near. Our peculiar climate curing the same on the land and our horses and cattle living upon it the year around, running on the open ranges, is no longer doubted even by the incredulous east. I saw hundreds of steers last March in the Madison valley that had been running out on the open range all winter, with no feed but that found on the ground, that were fat enough for the shambles of any market. However, you must bear in mind that the upper Madison range is the best in Montana, has not been eaten out and is not over crowded, as in most other portions of the territory. Madison county is literally a horse heaven, and no horse raiser has ever a thought of his horse stock not getting enough to eat on the mountains and foot hills of the open range. Sheep and wool can be grown very profitably in the county, and it is rare that they require any further outlay and expense than for a herder, so admirably adapted are our mountains for their successful raising. As an illustration of the profit connected with sheep raising, I will give you the experience of an average sheep man of the county. Five years ago he borrowed the money to buy 600 ewes, paying \$6 for the sheep and one and a quarter per cent per month for the money; he has now 3,000 head of sheep and does not owe a dollar. Tariff or no tariff, the sheep business will pay in Madison county; of course sheep men wish the tariff to remain as it is, but neither the Bushmen nor Hottentots can produce like wool for less money than the Montana shepherd. True some men who have engaged in the sheep business have failed, but I also heard of a man once who discovered a mine of solid gold 3 feet thick, with 6 feet of solid silver on top of the gold, and the man being poor, with no great amount of capital, broke himself, his friends and family, sinking a shaft through the silver cap endeavoring to get to the gold, and died of a broken heart over his misfortunes and bad luck.

"C."

The county is situated in the southern portion of the territory, and is bounded on the north by the counties of Jefferson and Gallatin, on the west by Beaver Head and Deer Lodge counties, on the east by Gallatin county, and on the south by Idaho territory. It contains grand ranges of mountains, long rapid rivers, and extensive and fertile valleys.

Tobacco Root range of mountains, shoots out in a northerly course from the Rocky Mountains west of Henry's Lake. It separates the valleys of the Madison and Willow creek, from those of the Jefferson and Ruby. Its principal peak is Mount Baldy, which attains an elevation of 9,191 feet, and has an extensive plateau at an altitude of 6,285 feet. The range is 85 miles in length.

Snow Crest range, a spur from the Tobacco Root, shoots out from Mount Baldy in a southwesterly course, and separates the valleys of the upper Ruby and Black Tail Deer. It is 30 miles in length, and at the head waters of Black Tail Deer creek attains an elevation of 10,067 feet.

The Madison range leaves the Rocky Mountains near Yellowstone lake, forms the divide, at first, between the Yellowstone and Fire Hole rivers, and then the dividing line between the counties of Madison and Gallatin; it runs very nearly parallel with the Tobacco Root range, and is about the same length. Its principal elevated peak is Mount Washington, altitude not yet determined.

The main range of the Rocky Mountains, which divides the head waters of the Columbia and Missouri, comes into the county near the head waters of the west fork of the Madison river. They meander, send out sharp spurs, and swing in ox-bow shapes, but their general course is west by northwest. The principal elevations are Mount Jefferson and Table Mountain. Mount Jefferson is situated two miles west of Henry's Lake, at the termination of the principal meridian of Montana surveys. Its height is 9,000 feet. Table Mountain is at the dividing line between Madison and Deer Lodge counties, and has an elevation of 8,350 feet.

The Ruby Range, the most beautiful mountains in the county, appears to be isolated from other ranges and spurs. It forms an angle and is 30 miles in length. It separates the valleys of Beaver Head and Lower Ruby, and attains an elevation of 8,300 feet above the level of the sea.

The county is watered by the Madison, Jefferson, Ruby, Red Rock, Beaver Head and Big Hole rivers, and their numerous tributaries. The principal valleys are those through which these waters flow, and they bear the same name as the rivers. For fertility of soil, they are unsurpassed by any lands on the continent.

The principal minerals are gold, silver, lead, copper, iron and coal—precious stones are quite abundant, and among the most valuable are rubies, garnets and agates. There are ledges of white marble, and also of excellent building rock; gold, however, is the chief article of export.

The greater portion of the timber is confined to the mountains and head waters of the streams. It is of a superior quality for nearly all uses; is exhaustless in quantity, and easy of access; it consists of red, yellow and white pine, spruce, fir and cedar. There are some cottonwood trees on the banks of the rivers, and occasionally a grove of birch and quaking aspen trees may be found in the valleys.

One of the prominent charms of the valleys is their clear, flowing streams, which abound with delicious brook and salmon trout, and, in some places, mountain bass are plentiful. The bear, antelope, wolf, elk and mountain sheep make their homes in the timber, and grouse, pheasants, fool-hens, geese, ducks, squirrels, rabbits, foxes, beavers, etc., are quite plenty in the valleys, and in the vicinity of lakes and rivers.

The climate is delightful, the worst storms happen in the winter season, and are then chiefly confined to the mountains. At the approach and departure of cold weather, there are sometimes moderate rains; but often months pass by without witnessing a cloud in the horizon. It is emphatically the land of sunshine, and the atmosphere seemingly contains an absence of all the elements of pestilence and disease which place life in jeopardy. It appears to be the conviction of all who are familiar with the salubrity of the climate, that if proper care were taken, the laws of health obeyed, barring accidents, there are no reasons why persons spending their lives here, should not attain the ripe old age of a hundred years.

Hay

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